

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
TORONTO,

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THE BRITISH PHARMACEUTICAL CONFERENCE.

AN ORGANIZATION FOR THE ENCOURAGEMENT OF PHARMACEUTICAL RESEARCH AND THE PROMOTION OF FRIENDLY INTERCOURSE AMONGST PHARMACISTS.

This Association of Chemists and Druggists and others interested in Pharmacy is managed by about twenty unpaid officers annually elected by the members.

ANNUAL MEETINGS OF MEMBERS.

1863, NEWCASTLE. 1864, BATH. 1865, BIRMINGHAM. 1866, NOTTINGHAM. 1867, DUNDEE. 1868, NORWICH. 1869, EXETER. 1870, LIVERPOOL. 1871, EDINBURGH. 1872, BRIGHTON. 1873, BRADFORD. 1874, LONDON. 1875, BRISTOL.

The chief business of the meetings is the communication of written investigations made by members during the year, and includes discussions on such papers by the assembled members and visitors.

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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a handsome octavo volume of about 500 pages, containing the proceedings at the yearly meeting and a report on the progress of pharmacy, or YEAR-BOOK, comprising abstracts of papers on pharmacy, materia medica, and chemistry, and on new preparations, processes, and formulae, published at home and abroad during each year. The funds of the Conference, composed of annual subscriptions of seven shillings and sixpence, are devoted to the production of this useful book, no pains being spared to make it the desk companion of the year, and an invaluable permanent work of reference for every chemist and druggist. The Executive Committee of the Conference trusts that members will show the current Year-Book to their friends and acquaintances—principals, assistants, or pupils—and obtain as large a number of new members as possible. Alphabetical lists of (1) the names and addresses of subscribers, and (2) of the towns in which they reside, will be found in each Year-Book.

NOMINATION FOR MEMBERSHIP.

Gentlemen desiring to join the Conference can be nominated at any time on applying to a Secretary or either of the officers or members. The Name and Address of each candidate to be written legibly, and forwarded to the London Secretary, who will sign it, if necessary. The subscription may be sent at the same time.

THE ANNUAL SUBSCRIPTION.

The Annual Subscription is Seven Shillings and Sixpence. For this sum each member is entitled to one copy of the Year-Book, carriage free; and to attend the Annual Meetings. Members residing abroad can be supplied with the Year-Book on paying the annual subscription, and the postage to the respective countries, of a book weighing two imperial pounds.

Remittances may be by Post Office Order, made payable to John Attfield, at "High Holborn," or by stamps or cheque. The Conference year commences on July 1st, and Annual Subscriptions are due in advance on that date. They may be sent then or soon afterwards to the London Secretary; but to save members the trouble of remembering to transmit so small a sum, official application will duly be made for the amount. The Year-Book is posted as soon as published (in December) to every member who has previously paid his subscription. To members joining later the volume is posted immediately on receipt of a Money Order or other form of remittance. Members may still obtain any number of copies of the "1870" Year-Book (the first issued), or that for 1871 or 1872 on remitting 5s. 6d. per copy. The price of extra copies of the volume for 1873, or subsequent issues, will be 7s. 6d. Price of the Year-Book to non-members, 10s.

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*The Committee of Publication regrets that the protracted illness
of the Editor has somewhat delayed the issue of this volume.*

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YEAR-BOOK OF PHARMACY

COMPRISING

ABSTRACTS OF PAPERS

RELATING TO

PHARMACY, MATERIA MEDICA, AND CHEMISTRY,

CONTRIBUTED TO BRITISH AND FOREIGN JOURNALS,

FROM JULY 1, 1873, TO JUNE 30,

1874.

WITH THE

TRANSACTIONS

OF THE

BRITISH PHARMACEUTICAL CONFERENCE

AT THE

ELEVENTH ANNUAL MEETING

HELD AT

LONDON,

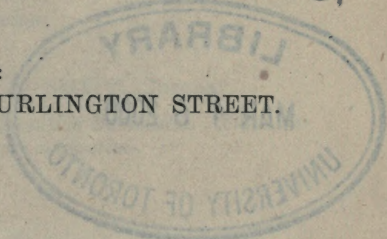
AUGUST, 1874.

ONTARIO
COLLEGE OF PHARMACY
44 GERRARD ST. E.
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J. & A. CHURCHILL, 11, NEW BURLINGTON STREET.

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British Pharmaceutical Conference.

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EDITOR OF THE TRANSACTIONS OF THE CONFERENCE.

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1874

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1871 to 1874, F. BADEN BENDER, F.C.S.

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THE most important ways in which a member can aid the objects of the Conference are by suggesting subjects for investigation, working upon subjects suggested by himself or by others, contributing information tending to throw light on questions relating to adulterations and impurities, or collecting and forwarding specimens whose examination would afford similar information. Personal attendance at the yearly gatherings, or the mere payment of the annual subscription, will also greatly strengthen the hands of the executive.

A list of subjects suggested for research, is sent to members early in the year. Resulting papers are read at the annual meeting of the members; but new facts that are discovered during an investigation may be at once published by an author at a meeting of a scientific society, or in a scientific journal, or in any other way he may desire; in that case, he is expected to send a short report on the subject to the Conference.

The annual meetings are usually held in the provinces, at the time and place of the visit of the British Association; that for 1875 will be held in Bristol.

Gentlemen desiring to join the Conference, can be nominated at any time on applying to either of the secretaries or any other officer or member. The yearly subscription is seven shillings and sixpence, payable in advance, on July 1st. Further information may be obtained from the secretaries.

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THE YEAR-BOOK OF PHARMACY.

The Conference annually presents to members a volume of about 500 pages, containing the proceedings at the yearly meeting, and an Annual Report on the Progress of Pharmacy, or Year-Book, which includes notices of all pharmaceutical papers, new processes, preparations, and formulæ published throughout the world. The necessary funds for accomplishing this object consist solely of the subscriptions of members. The Executive Committee, therefore, call on every pharmacist—principal, assistant, or pupil—to offer his name for election, and on every member to make an effort to obtain more members. The price of the Year-Book to non-members is ten shillings. The constitution and rules of the Conference, and a form of nomination for membership, will be found at page 383.

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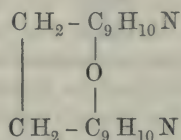
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INTRODUCTION.

PHARMACEUTICAL CHEMISTRY has received its fair share of the attention devoted to chemical research during the eleventh year of the British Pharmaceutical Conference. If the work done is not very conspicuous in a quantitative sense, it is certainly of a high quality, and will bear comparison with that of any previous year. Foremost of all ranks the exhaustive study of the cinchona alkaloids by Dr. O. Hesse, the well known chemist and quinologist, to whose previous researches the pharmaceutical world was already indebted for much of its knowledge of the chemistry of the cinchona barks. In Dr. Hesse's opinion, which no doubt will be generally endorsed, the following alkaloids only have been proved to exist in these barks:—quinine, cinchonidine, cinchonine, paricine, quinamine, paytine, and conchinine (Pasteur's quinidine); of these, quinamine, paytine, and conchinine appear to form a group, and to be capable of being converted one into another under the influence of vital action. The so-called amorphous bases he considers to be decomposition products of the true cinchona alkaloids, as they can be artificially prepared from the latter, and are frequently formed from them during their preparation. On this point, however, he is contradicted by an equally eminent quinologist, Dr. de Vrij, who contends that quinicine and cinchonicine, the decomposition products alluded to, are not identical with the amorphous alkaloid, as their oxalates differ essentially from the oxalate of the latter; and this statement receives further support from Mr. D. Howard's observation, that the compounds of the amorphous substance with acids cannot be crystallized, whereas salts of quinicine can be obtained in a crystalline form. The publication in the *Pharmaceutical Journal* of Dr. de Vrij's practical method for the separation of the mixed alkaloids from cinchona barks will be welcomed as a valuable contribution to British pharmaceutical literature. The same author recommends a new and simple process for the preparation of quinamine, by means of which he obtained 0.38 per cent. of the pure alkaloid from samples of red cinchona quill bark received from the plantations in British Sikhim. The solution of the sulphates of the mixed alkaloids is treated with Rochelle salt, then filtered, to remove the tartrates of quinine and cinchonidine,

and the filtrate shaken with caustic soda and ether. The ethereal solution which contains the amorphous alkaloid and the quinamine, with slight traces of cinchonine, is distilled and the residue converted into neutral acetate, from the solution of which the amorphous substance is precipitated by sulphocyanide of potassium. From the filtrate which contains the sulphocyanide of quinamine, the alkaloid may be precipitated by Na H O , and crystallized from boiling alcohol.

Dr. Weidel's researches on the oxidation products of cinchonine pave the way to the discovery of the chemical constitution of this alkaloid, and lead to the provisional adoption of the hypothetical formula



which may serve as a basis for further investigations.

Altogether the year's literature on the chemistry of cinchona alkaloids presents a vast amount of thought and labour.

Chroton chloral hydrate, which was introduced into medicine by Dr. O. Liebreich, the discoverer of the medicinal properties of chloral hydrate, is gaining much favour with the medical profession as a sedative, especially in cases of *tic douloureux* and other forms of neuralgia. Its specific action on the *nervus trigeminus* marks it out as a most valuable remedial agent. The dose ranges from one to ten grains, but small doses (two to five grains) are most generally given, and repeated several times, at intervals of an hour. It does not depress the heart's action like chloral hydrate, and is indicated, therefore, in cases of cardiac disease where the use of the latter remedy is unsafe. Croton chloral, $\text{C}_4 \text{H}_3 \text{Cl}_3 \text{O}$, is formed by the action of chlorine upon aldehyd, and possesses no relation to croton oil, though its chemical constitution proves it to be the tri-chlorated aldehyd of crotonic acid. A full account of its hydrate, its mode of preparation, and its chemical and medicinal properties will be found in the essays of Dr. O. Liebreich and Mr. A. H. Mason.

Those who have hitherto studied the action of sulphuric acid on chloral appear to have overlooked the fact that the two substances are capable of forming a chemical compound. That such is the case is shown by Mr. T. Grabowsky, who finds that a mixture of chloral and fuming sulphuric acid forms a white mass of large

crystals, which is neither insoluble chloral nor chloralide, as was supposed, but a compound of sulphuric acid and chloral, the analysis of which gives the formula $C_8H_6Cl_{12}O_{11}S_2$, corresponding to an anhydride of the neutral sulphate of chloral.

The direct synthesis of ammonia may be accomplished by the action of induced electricity on a mixture of hydrogen and nitrogen, as is shown by Mr. W. F. Donken and by Messrs. Thénard. The quantity of ammonia thus produced is, however, very small.

The unsatisfactory nature of the tests for distinguishing creasote from carbolic acid has induced Mr. A. M. Read to reinvestigate this subject. The results of his experiments prove the decided superiority of the test with strong solution of ammonia over all the others. The reactions of carbolic acid also form the subject of an essay by E. Polacci, and of another by E. Jacquemin, who suggests a new and very delicate test, which he recommends especially for the detection of phenol in toxicological examinations, as the presence of colourless organic substances, such as alcohol, soap, fatty matter, etc., does not interfere with it. This test is performed by mixing the carbolic acid with an equal weight of aniline, and then adding some sodium hypochlorite, which will at once produce a deep blue coloration due to the formation of erythrophenate of sodium. The same author also gives simplified processes for the detection of phenol in blood, urine, milk, the heart, lungs, liver, etc., which are based on the application of his new test.

It is well known that the ordinary methods of testing dextrine for glucose, by means of Fehling's solution, or of solutions of $CuSO_4$ and $NaHO$ are unreliable, as these tests throw down cuprous oxide from solutions of the purest dextrine, unless the latter are extremely weak. To remedy this defect, Mr. C. Barfoed proposes the application of a solution of neutral cupric acetate, slightly acidified by acetic acid, which does not affect pure dextrine at all, but forms a precipitate of Cu_2O when boiled with a solution of glucose and allowed to stand for two hours.

The process adopted in the U.S. Pharmacopœia for the preparation of iodide of ammonium, is strongly advocated by C. Rice, for the manufacture of the bromide. Strong hot solutions of KBr and of $(NH_4)_2SO_4$ are mixed, and, when cool, alcohol is added. The clear liquid is then decanted from the precipitated K_2SO_4 and concentrated to the point of crystallization. The preparation thus obtained contains a very small amount of sulphate of potassium, but is otherwise very pure and well suited for photographic and medicinal use.

The alkaloids and their analytical reactions have received the attention of a number of investigators. M. Schlagdenhauffen makes use of the well known action of pyrogallie acid on alkalies, for determining the alkalinity of the various alkaloids, drawing his conclusions from the degree of coloration produced, and from the time required for its development. He employs an alcoholic solution of pyrogallie acid mixed either with mercuric or with ferric chloride. The first named mixture produces a brown, and the latter a deep blue-violet colour on the addition of alkaline substances or of true alkaloids. Mr. R. Schneider finds that sugar and sulphuric acid produce characteristic colorations with several alkaloids, and that morphine, codeine, aconitine, delphinine, and chelidonine, may be thus detected and distinguished. H. Brunner strongly recommends Pettenkofer's test for digitaline, by which he succeeded in detecting that substance in 1 c.c. of a decoction of 0.3 gramme of foxglove leaves in 180 c.c. of water. He also recommends the use of chromic trioxide instead of potassium bichromate and sulphuric acid in testing for atropine. The alkaloid should be placed upon a few crystals of the trioxide in a porcelain dish, and a gentle heat applied until the reduction of the trioxide causes it to assume a green colour, when the characteristic odour will be distinctly perceived. The separation and detection of strychnia in poisoning cases is, according to MM. J. St. Clair-Gray and J. B. Lyman, best effected by placing the substance under examination, with water and acetic acid, on a dialyzer, evaporating the dialysate to a small bulk, shaking with successive portions of chloroform, and finally shaking the aqueous solution with an excess of ammonia and chloroform. The latter takes up the strychnia, and leaves it on evaporation in a sufficiently pure state to be submitted to the chemical and physiological test. How much the application of chloroform for dissolving vegetable poisons may be extended, is shown by M. J. Nowak, who gives a list of twenty alkaloids, which are all taken up by this solvent from alkaline solutions.

Stas Otto's method for the detection of alkaloids in forensic examinations has been brought up to the present standard of science, and is presented to the readers of the Year-Book in a tabular form compiled by H. Brunner.

A volumetric process for the estimation of emetine, aconitine, and nicotine, is published by M. C. Zinoffsky. Fifteen grams of the powdered ipecacuanha, aconite, or tobacco, are treated with sufficient alcohol, slightly acidified by H_2SO_4 , so as to bring up the bulk to 150 c.c. From 100 c.c. of the filtrate, the alcohol is removed by heat, and the residue mixed with a standard solution of iodo-

hydrargyrate of potassium until a filtered portion ceases to be affected by this reagent.

Mr. Groves continues his valuable researches on the different aconitines, the results of which will be found in the Proceedings of the British Pharmaceutical Conference. The analyses of the three alkaloids, aconitine, pseudaconitine, and the bitter alkaloid, undertaken by Dr. C. R. A. Wright, reveal the curious fact that these substances which differ so widely, both from a chemical and physiological point of view, have the same composition, and are either isomers or polymers.

Two improvements are suggested in reference to acidimetric and alkalimetric estimations: one by M. L. d'Henry, consisting in the application of the yellow sodium light for observing the changes in the colour of litmus; and the other by Mr. Eugen School, consisting in the use of a neutral solution of alizarin in place of tincture of litmus. As alizarin greatly exceeds litmus as an indicator of acid and alkaline reaction, the latter suggestion will, no doubt, be received with general favour.

Mr. Esilman's method for estimating alumina in mineral phosphates by means of hyposulphite of sodium forms the basis of an improved process for the determination of alum in bread, by Mr. E. L. Cleaver. The alumina being precipitated and weighed as phosphate, the tedious operation of separating it from the phosphates is thus avoided, and the analysis performed in a comparatively short time.

The literature on adulteration has been productive of some valuable contributions to the testing of milk.

Mr. Wanklyn simplifies the determination of the total solids by evaporating the milk in a platinum dish, without the addition of sand or other insoluble mineral powder, and drying the residue at 100° instead of 110° C.; and his results are sufficiently accurate for all practical purposes. To prove the fraudulent addition of water he relies on the percentage of solids not fat, which, he, says, is very constant in pure milk, and never falls below 9.3. Dr. Voelcker, on the other hand, denies that there is anything like constancy in the composition of milk, and supports his statement by giving the results of analyses of numerous samples. He is no doubt correct as regards the quantity of any individual constituent of milk, but the bulk of scientific evidence makes it none the less certain that, despite the great variability in the percentage of butter, caseine, and milk-sugar, the total amount of the solids not fat is much more constant, and is never less than nine per cent. by weight in unadulterated milk.

Mr. Horsley introduces a new lactometer, by means of which the butter fat may be estimated in a sample of milk in a very short time, and with a sufficient accuracy for most purposes. His experiments illustrate the curious and hitherto unobserved fact, that the long continued shaking of milk with ether, effects a complete disruption of the fat globules without the addition of an alkali.

Mr. Stoddart, who brought this new lactometer under the notice of the Conference, also showed its applicability to the testing of butter, and the determination of its percentage of pure butter fat. His remarks on this point will be exceedingly valuable to the general pharmacist, who is hardly in a position to avail himself of the elaborate process for the analysis of butter recommended by Dr. J. Campbell Brown.

Volumetric analysis never fails to secure fresh contributions, and among those published in the current year, there are again some having a direct bearing on practical pharmacy. The estimation of several alkaloids by means of a standard solution of iodo-hydrargyrate of potassium has been already alluded to. MM. Buisson and Ferray estimate bismuth in the subnitrate by dissolving the latter in HNO_3 , adding NaHCO_3 in slight excess, and then an excess of acetic acid, and precipitating the bismuth from the filtrate with a titrated solution of iodic acid. The titration of silver in acid solution by means of a standard solution of sulphocyanide of ammonium is strongly recommended by Mr. J. Volhardas being equal in point of accuracy to Gay-Lussac's method, and having the advantage of a capital indicator in the ferric sulphate which is added to the silver solution at the commencement of the operation. Mr. E. Bohlig gives a new mode of estimating chlorine and sulphuric acid in their combinations with alkalis. The chloride is converted into AgCl by AgNO_3 , and the sulphate into BaSO_4 by BaCO_3 in the presence of free CO_2 ; and the quantity of alkaline carbonate thus formed in either case is then determined by means of a standard acid. Mr. Stoddart suggests a modification of Liebig's method for the estimation of phosphoric acid, consisting in the application of sulphocyanide of potassium instead of the ferrocyanide as an indicator. A rough experiment is first made by adding the standard solution of ferric chloride to the acetic solution of the phosphate mixed with a little of the sulphocyanide, until a reddish coloration is produced, and having thus approximately ascertained the quantity required, a second experiment is performed, in which single drops of the indicator are mixed with filtered drops of the liquid on a white slab,

until a reddish tint is produced by the union of the two drops. No very reliable results can be expected from the first experiment alone, as the precipitated ferric phosphate is slowly decomposed by the sulphocyanide, thus causing a red coloration before sufficient iron has been used for the complete precipitation of the phosphoric acid. A very handy process for the quantitative analysis of sugar of lead is described by Prof. Fresenius. To the solution of a weighed quantity of the sugar of lead, standard sulphuric acid is added in moderate excess to precipitate the lead, and the mixture made up with water to a given bulk. After the sulphate of lead has settled down, the excess of H_2SO_4 is determined on a measured portion of the decanted liquid by BaCl_2 , and the acetic acid in another portion by a standard solution of NaHCO_3 .

The chemical constitution of bleaching powder forms the subject of an animated discussion between Mr. Goepner and Prof. Schorlemmer in the Transactions of the German Chemical Society, the former regarding that substance as a compound of lime (CaO) and chlorine, the latter upholding Odling's formula $\text{Ca} \begin{Bmatrix} \text{Cl} \\ \text{O Cl} \end{Bmatrix}$, which represents chlorinated lime as chloride of calcium with one atom of chlorine displaced by the hypochlorous radical OCl .

A new reaction of iodates by Mr. E. Polacci is based on the fact that phosphorus partially reduces iodates to iodides, giving rise to the formation of phosphoric acid, which, reacting simultaneously on the iodide and on the undecomposed portion of the iodate, liberates iodic acid and hydriodic acid, which by mutual decomposition form iodine and water.

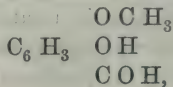
Iodide of potassium may now be advantageously prepared from cuprous iodide, large quantities of which are being imported from Peru. A simple and cheap process for its manufacture from this mineral is published by Mr. G. Langbein.

The difficulty of keeping hydrocyanic acid of the Pharmacopœia strength unchanged is strikingly illustrated by Mr. Towerzey's experiments, and various suggestions have been made with a view of giving greater stability to this preparation. No fewer than four papers on this subject were read at the meeting of the Conference.

The attention devoted to the detection of poisons in forensic investigation has not been confined to the alkaloids. The detection of hydrocyanic acid in such cases is treated of in an elaborate essay by Mr. H. Struve, who after a careful experimental comparison of the various means of showing the presence of this poison in the

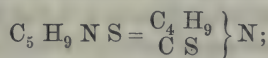
distillate obtained from the acidified organic matter, gives his decision unhesitatingly in favour of the test with sulphide of ammonium and ferric chloride. Having observed that sulphocyanides may occur normally in the blood, he points out the importance of proving that any cyanogen found in blood, etc., really existed therein as a cyanide and not as a sulphocyanide. The detection and estimation of free phosphorus in food, vomits, and other fatty substances, is accomplished by M. D. A. von Bastelaer by means of a new process, which is based on the solubility of this poison in ether, and its indifference to solution of ammonia during a short contact. As the phosphorus is separated and weighed in a pure state, this process commends itself in all cases when the quantity of the poison is such as to admit of an estimation. But as a qualitative test, and especially for the detection of mere traces of phosphorus, it can hardly equal the excellent methods recommended by Mitscherlich and by Fresenius and Neubauer.

The chemistry of the carbon compounds continues to advance with rapid strides. Few of its achievements are likely to create a deeper and more general interest than the artificial formation of *vanillin* (vanillic acid), the aromatic principle of vanilla. Messrs. F. Tiemann and H. Haarmann show that this substance can be prepared from *coniferin* ($C_{16} H_{22} O_8 + 2 Aq$), a glucoside existing in the cambium of coniferæ. By heating an aqueous solution of coniferin for several hours with bichromate of potassium and sulphuric acid, in a flask furnished with a returning condenser, then agitating the cooled and filtered liquid with ether, and evaporating the ethereal solution, a residue is obtained, which after repeated recrystallization from water and decolorisation with animal charcoal, forms fine white crystals, having the odour and taste of vanilla. This substance has the same composition as vanillin ($C_8 H_8 O_3$), with which it is also identical in its melting point, and its behaviour to various solvents. The most absolute proof, however, of the identity of the two substances lies in the fact that, by fusion with caustic potash, both form protocatechuic acid, $C_7 H_6 O_4$, which by heat may be split up into pyrocatechuic acid $C_6 H_6 O_2$, and CO_2 . Both protocatechuic acid and pyrocatechuic acid may also be obtained direct from coniferin. The formation of protocatechuic acid from vanillin throws light upon the chemical constitution of the latter, showing it to be the mono-methyl-ether of protocatechuic aldehyde, as represented by the formula

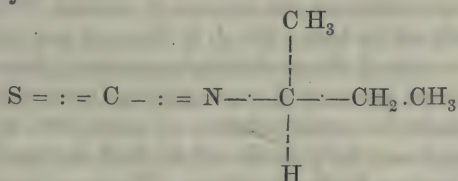


a view which is further corroborated by the observation that dilute hydrochloric acid, acting under pressure on vanillin, splits it up into methyl chloride and pyrocatechuic aldehyde.

The essential oil of *Cochlearia officinalis* (the scurvy-grass) has repeatedly been the object of chemical research. Its similarity to the oil of mustard was observed as early as 1840 by Mr. J. E. Simon, but seems to have been forgotten afterwards, as Mr. O. Geisler speaks of it in 1857 as an oxysulphide of allyl, a substance containing no nitrogen. Prof. A. W. Hofmann's recent investigation of the same subject (which will be found recorded on page 245 of this volume), shows that this substance is a mustard oil of the butyl series, the composition of which is represented by the formula



and further, that it is derived from the secondary butylic alcohol (methyl-ethyl-carbinol), this being the only one of the four isomeric butylic alcohols, whose corresponding mustard oil is identical with the oil of scurvy grass in its odour, specific gravity, and boiling point. The results of a careful examination of the corresponding amines and sulphocarbamides, fully support the author's conclusion that the essential oil of *Cochlearia officinalis* is the isosulphocyanate of the secondary butylic alcohol.



The synthesis of this oil will unquestionably rank as one of the most important scientific achievements of the year.

A number of other volatile oils have also received the attention of chemical investigators. The oils of *Tropaeolum majus* and *Nasturtium officinale* have been examined by Prof. A. W. Hofmann; the oil of *Acorus calamus*, by Mr. A. Kurbatow; oil of dill, by Mr. R. Nietzki; oil of chamomile, by M. E. Demarcay; oil of wormwood, by Messrs. E. Beilstein and A. Kupffer; the same oil along with the oils of citronella and cajeput by Dr. C. R. A. Wright; and eucalyptol, by Messrs. A. Faust and J. Homeyer. The latter (eucalyptol) is now shown to be a mixture of a terpene and a cymol, its composition being represented by the formula $\text{C}_{10} \text{H}_{14} + 2 \text{C}_{10} \text{H}_{16}$. The researches on the formation of cymol from oil of turpentine by

Messrs. Barbier and Oppenheim have been repeated by Prof. Kékulé, who, by employing iodine instead of bromine, obtains the same result with far greater facility. Besides cymol another hydrocarbon, colophene, is formed during the action.

The success attending the cultivation of the *Cinchona* trees in Java bids fair to surpass the keenest expectation. Mr. Julius Jobst, who has examined samples of Javanese barks, which arrived in Holland during the last two years, states in his last report, that most of the barks show a decided improvement, both in appearance and in their percentage of alkaloids. *Cinchona officinalis*, *C. Hasskarliana*, and *C. Pahudiana*, show an increase in quinine and a decrease of cinchonine as compared to the corresponding barks of the previous year's importation. Two out of the four samples of *Calisaya* bark exhibit a decrease in quinine, but the two others contain no less than 5.75 and 7.24 per cent. of alkaloids, and 2.35 and 5.57 per cent. of quinine respectively, the last percentage being the highest yet found in any large quantity of bark. The bark yielding this large amount of quinine is the produce of seeds obtained from Bolivia, and Hasskarl states that barks of the same description have been found to contain as much as 10.9 per cent. of quinine, which is equivalent to 14.67 per cent. of the sulphate. The bark of *Cinchona succirubra* is rich in cinchonidine, the amount of which seems to increase at the expense of quinine during the progressive growth of the tree. Mr. J. E. Howard also reports favourably on the success of the cinchona plantations in Java.

The fraudulent practice of impregnating inferior *cinchona* barks with an alcoholic or acetic solution of quinoidine, as pointed out by Dr. Hager, is now fully confirmed by Prof. Bernatzik, who gives an improved process for its detection. The same process may also be employed for detecting a falsification of cinchona barks with alcoholic or acetic solutions of cinchonine or cinchonidine.

Dr. de Vrij, in a paper read at the London meeting of the Conference, suggests a very simple process for roughly estimating the pharmaceutical value of cinchona barks, consisting in the addition of hydrochloric acid and of lime water to separate portions of an aqueous percolate obtained from the powdered bark, and judging the quantity of alkaloids and astringent matter present from the bulk of the precipitates formed. He looks upon Indian barks as better adapted for pharmaceutical purposes than the American barks, and considers an alcoholic extract as the best form in which cinchona bark can be prescribed. The same author publishes the results of his analyses of thirty samples of cinchona barks from Ootacamund,

showing among many other points of interest the remarkable fact, that a renewed bark of *cinchona succirubra* may contain a very considerably larger amount of quinine than the original bark, though both contain the same or nearly the same percentage of total alkaloids.

Eucalyptus globulus continues to command a great deal of attention and interest, and is gaining rather than losing in its reputation for improving the unhealthy nature of marshy districts. The anti-malarial influence appears to be due less to any antiseptic exhalations from its leaves, than to the draining of the ground effected by its far-spreading roots, which possess the power of absorbing water to a marvellous extent. Professor Bentley's able lecture on the character, properties, and uses of *Eucalyptus globulus*, and other species of eucalyptus, of which an abstract appears in this volume, will form a valuable addition to the already copious literature on this subject.

Jaborandi is the name of a new Brazilian drug, the properties of which are described by Dr. S. Cutinho, of Pernambuco, and Professor Gubler, of Paris. It is recommended as a powerful diaphoretic and sialogogue; and unless the accounts of its effects are greatly exaggerated, it is sure to become a most valuable addition to vegetable materia medica. It consists of the leaves and small twigs of a plant which Professor Baillon believes to be *Pilocarpus pinnatus*, a rutaceous shrub indigenous to the province of St. Paul, in Brazil. This view, however, requires further corroboration.

A new narcotic, called pituri, is mentioned by Dr. G. Bennett and Dr. Bancroft. It consists of dried leaves, which are used by the natives of Queensland chiefly for chewing and smoking, as a stimulating narcotic. Its botanical origin is as yet unascertained.

The *Rhizoma Chinæ* of the modern pharmacopœias, which [figured as *Radix Chinæ* in the older ones, is now shown by Dr. O. Th. Sandahl to be neither a root nor a rhizome, but a genuine tuber, characterized as such by the copious depositions of starch in its ramifications.

M. Pavese's statement, that koussine, the active principle of koussou, only occurs in the pollen, is contradicted by Dr. C. Bedall, who proves that it is also contained in the stem and leaves, though in much smaller quantities. Its formula is $C_{26}H_{22}O_5$.

The importance of requiring the preparations of cantharides to be made from cantharides of a standard quality is forcibly illustrated by Dr. Fumouge, who shows that the amount of cantharidin in these insects may vary from 1.75 to 5 per cent.

We must not omit to draw the attention of our readers to two valuable contributions to the literature on aloes and ergot, by Dr. E. R. Squibb, as interesting alike to the medical practitioner and the pharmacist.

Whatever doubt may still have existed as to the identity of scammonine prepared from the root with that prepared from the gum resin of *Convolvulus scammonia*, is now completely removed by the researches of Professor Spirgatis, which prove that there is not the slightest difference between the two preparations as regards their appearance, properties, their behaviour to solvents, and chemical composition. The perfect solubility of pure scammonine from either source in oil of turpentine also shows, that the application of the latter as a test for the detection of an adulteration of resin of scammony with common resin, as recommended in various books on materia medica, is based upon erroneous conceptions.

Artemisia Cina, the true mother-plant of the Levant worm-seed, of which a short notice appeared in the Year-Book of Pharmacy for 1872, is more fully described in the present volume. This plant may be readily distinguished from other species of *Artemisia* by its naked leaves and involucreal scales, and by the greater abundance of the resinous papillæ, which are the seat of the santonin.

Mr. J. R. Jackson gives a description of the botanical details and the uses of *Areca catechu* (the areca palm), which will be read with the greater interest since the seeds of this plant have found their way into the new edition of the British Pharmacopœia, and are gaining favour with the medical profession on account of their anthelmintic properties.

To Mr. D. Hanbury and Mr. Sydney Plowman, pharmacists are indebted for the first reliable information on the botanical source and the physical and chemical properties of a peculiar kind of camphor, which is known in Chinese commerce as *N-gai* camphor, and is used extensively in medicine, and in the manufacture of scented Chinese inks. Mr. Rondot, who first drew attention to this variety of camphor, stated, that it is extracted from the leaves of a plant, called in China N-Gai, which he supposed to be a species of *Artemisia*; but Mr. Hanbury now shows it to be the produce of *Blumea balsamifera*, D.C., a tall coarse-looking plant of Eastern Asia, an abundant weed in Assam and Burma, and common throughout the Indian islands. N-gai camphor occurs in a pure and in a crude state. In the former it consists of colourless crystalline pieces of the odour of ordinary camphor; in the latter it forms a dirty white crystalline powder, having the odour of wormwood. Both

kinds are heavier than water. Mr. Sydney Plowman, who has conducted the chemical investigation of this camphor, arrives at the conclusion that it is isomeric with Borneo camphor, and that, like the latter, it may be regarded as a monatomic alcohol, of the series $C_n H_{2n-3} H O$, viz., $C_{10} H_{17} H O$, the aldehyde of which is laurel camphor, $C_{10} H_{16} O$.

Koegoed, a new drug, which was brought under the notice of the British Pharmaceutical Conference, at the Brighton meeting, by Mr. Keyworth, is now shown by Mr. E. M. Holmes to be the root and procumbent stem of *Mesembryanthemum tortuosum*. In addition to its value as a sedative for cattle, this drug seems to possess narcotic properties which deserve further investigation.

The results of Professor Flückiger's researches on "the Chemistry of Elemi" and "the Stearoptene of Oil of Nutmeg" form the subject of two valuable contributions to the London meeting of the Conference. In the author's opinion the constituents of elemi are an essential oil, $C_{10} H_{16}$; a crystallized resin (elemi or amyri), $2 (C_{10} H_{16}) + H_2 O$; an amorphous resin (?), $2 (C_{10} H_{16}) + 2 H_2 O$; and bryoidin, $2 (C_{10} H_{16}) + 3 H_2 O$. The crystalline matter, separating from oil of nutmegs, and commonly called myristicin, is found to be myristic acid, $C_{14} H_{28} O_2$, which in the form of trimyristate of glyceryl is the chief constituent of the fatty part of nutmegs.

The value of pomegranate root bark as a remedy for tapeworm is highly spoken of by Dr. de Vrij, who states that the efficacy of this drug does not depend either on its freshness or on the place where it is collected. He obtained excellent results with an extract made from a bark eleven years old.

The merits of cortex rhamni frangulæ as a mild but reliable aperient, and the desirability of its more extended application in British pharmacy, are again urged by Mr. Baildon, whose statements on this subject are fully endorsed by those who took part in the discussion at the last Conference meeting. A concentrated cold-made infusion is recommended as the best form of administering this bark.

The journals of the year contain notices of a number of new remedies besides those to which reference has already been made. The leaves and young branches of *Comptonia asplenifolia* are described by Mr. R. T. Chiles as a mild astringent tonic, having considerable alterative properties, and being used with success in American domestic practice for diarrhoea and dysentery. Trompatilla (the short segments of the stem and branches of a species of *Bouvardia*) is mentioned by Prof. Maisch as a remedy for the

prevention and treatment of hydrophobia. The same author refers to the use of *Geranium maculatum* for dysentery; of *Gerardia quercifolia* as an antidote for snakebite; and of the branches of *Verbena bracteosa* for the treatment of scrofulous affections. The root bark of *Ailanthus glandulosa* is spoken of as a remedy for dysentery used in China and Japan. The root of *Gelsemium semper-virens*, which is largely used in American pharmacy, chiefly in cases of odontalgia, promises to gain favour with British practitioners, to whom it is recommended by Dr. Sawyer, of Birmingham. Last, but by no means least, we refer to an elaborate essay on the indigenous remedies of the Tuscans, by Mr. Henry Groves, which was read to the London meeting of the Conference.

A large number of vegetable drugs have formed the object of chemical and microscopical research. Cortex Amygdalæ Persicæ has been examined by Mr. J. Howard McCrea; the bark of *Cephalantus occidentalis*, by Mr. E. M. Hatton; the bark of *Prinos verticillata*, by Mr. W. Leech; karakin, the bitter poisonous constituent of the kernel of the karaka berry, by Mr. W. Skey; ylang-ylang, by Mr. H. Gal; resina podophylli, by Mr. F. B. Power; osha root, by Mr. H. Haupt; *Veratrum viride*, by Mr. C. L. Mitchell; cortex juglandis cinereæ, by W. E. S. Dawson; the root of *Euphorbia Ipecacuanha*, by Mr. C. Petzelt; *Ophelia chirata*, by Dr. Kemp; and the root bark of *Maclura aurantiaca*, by Mr. A. King. Mr. E. Donath has examined the berries of *Juniperus communis*; Dr. Graeger the berries of *Berberis vulgaris*; Professor Flückiger, the buchu leaves; and Mr. E. S. Wayne the leaves of *Ricinis communis*.

The literature on the adulteration of drugs and food indicates an increased amount of activity, owing partially, no doubt, to the working of the Adulteration Act. The falsification of cinchona barks with acetic or alcoholic solutions of quinoidine, and the detection of adulterations in milk and butter, have been already referred to. As other publications of this class which have found a place in the present volume may be mentioned the articles on tea, by Mr. A. Wanklyn; the ash and extract of teas, by Mr. G. W. Wigner; the adulteration of scammony, by Mr. T. Greenish; mustard and its adulterations, by Dr. Hassall; the adulteration of tea, coffee, and pepper, by Mr. J. Bell; the adulteration of pepper, by M. G. Bouchardat; a new false Angustura bark, by Professor Maisch; the adulteration of serpentaria with the rhizome and rootlets of *Cypripedium pubescens*, by the same author; the coating of ginger with whitewash, by Mr. T. Garside; the adulteration of cascarella bark, arnica root, and belladonna root, by Mr. E. M. Holmes; the

substitution of the stem of *Chondodendron tomentosum* for the root, by Mr. J. Moss; the adulteration of balsam of Peru with styrax liquidus, by Mr. H. Schweikert; the substitution of *Gigartina acicularis* for carrageen moss, by M. J. Dalmon; the adulteration of linseed oil with cod oil, by M. A. Morell; the occurrence of almond meal in powdered ipacacuanha, by Mr. J. Mercer; the adulteration of gum arabic with dextrine, by Dr. H. Hager; the detection of oil of turpentine in essential oils, by Dr. G. Draggen-dorff; the adulteration of liquid storax with turpentine, by Dr. H. Hager; the detection of dextrine as an adulterant in lycopodium, by M. Lillard; the adulteration of gaultheria oil, by Dr. Pile, Mr. C. Bullock, and Professor Maisch; the detection of picric acid in beer, by Mr. H. Brunner; and the recognition of artificial colouring matter in port wine, by E. B. Shuttleworth.

Much attention has been devoted lately to the medicinal exhibition of phosphorus. Mr. A. W. Gerrard's suggestion to dissolve it in melted resin was at once improved upon by Mr. A. C. Abraham, whose recommendation of the use of balsam of tolu in place of resin has been adopted in the *Pilula phosphori* of the additions to the Pharmacopœia. Oil of phosphorus, which has long been in use on the continent, has also found a place in the new Pharmacopœia. A solution of phosphorus in alcohol and glycerin is recommended by Mr. J. Williams, mainly on the ground that it contains the element in an unoxidised condition, which is less certain to be the case with most of the other preparations in use. A formula for a tincture of phosphorus is given by Mr. A. Thompson. Numerous additions have been made to the already long list of formulæ for syrups of phosphates and the combination of phosphate of iron, and many of the older formulæ have been improved so as to suit the requirements of elegant pharmacy.

For the protection of hypodermic solutions from change the addition of one-sixth of a per cent. of carbolic acid is advocated by Dr. E. Squibb, who thinks that such an addition is unobjectionable in every respect. The same author suggests the application of ergot for subcutaneous injections, and recommends the aqueous solution of the extract (not the fluid extract) for this purpose.

The various preparations of koumiss furnish the subject of an elaborate article by Dr. V. A. Jagielski, which will prove the more interesting to our readers, as the popular appreciation of this substance as a dietetic remedy is continually increasing. The author speaks in high terms of its remedial powers in chronic gastric-

catarrh, in chronic pulmonary consumption, and in functional debility of the brain. In his opinion the milk of cows is as suitable for its preparation as mare's milk.

The various methods of obtaining pepsin, and the merits of the resulting preparations, have been investigated by Dr. C. Symes, who pronounces in favour of Mr. E. Scheffer's process (see "Year-Book of Pharmacy," 1872, p. 268) as combining economy in working with uniformity of excellence in the product. He also finds that undried mucus is more active than the same substance after drying; that the pure pepsin diffused through sugar of milk is more active than the mucus from which it is made; and further that wine partially destroys the activity of pepsin, and is an unsuitable vehicle for its administration. Pancreatine and its preparations are described by Mr. R. V. Mattison.

The yield of extracts has repeatedly been the object of pharmaceutical research. Mr. H. Werner's report on this subject contains the author's own results along with those previously obtained by M. Kostka and Dr. Hager, so that the data given cannot fail to be very useful to the practical pharmacist for the purpose of reference. Mr. W. A. Heathfield draws attention to the absence of appreciable quantities of alkaloids in the official narcotic extracts, especially in *extractum conii*, and hints that the coagulation and separation of the albumen may cause the loss or diminution of the active principle.

Mr. A. W. Gerrard's elaborate report on the official plaster, which was read at the London meeting of the British Pharmaceutical Conference may be justly regarded as one of the most important contributions to practical pharmacy. His suggestions were ably discussed at the meeting, and many of them will, no doubt, find due consideration in the next edition of the *Pharmacopœia*.

As another very important contribution to pharmaceutical literature, we refer to Professor Tichborne's paper on the Application of Oleic Acid in Pharmacy, in which he shows the advantages of the use of this acid in place of the various soaps in the preparation of the saponaceous liniments of the B. P. There appears to be some difficulty, however, for the present at least, in obtaining a supply of oleic acid of sufficient purity for pharmaceutical purposes.

In concluding our introductory remarks, we venture to express a hope that the higher standard of education now required of our young pharmacists, will be productive of a genuine appreciation of science on their part, and that, as time progresses, the "Year-Book of Pharmacy" will afford ever increasing evidence of their participation in the noble work of original research.

MATERIA MEDICA.



YEAR-BOOK OF PHARMACY.

PART I.

MATERIA MEDICA.

Cinchona Barks from Java. Julius Jobst. (*Ber. der deutsch. chem. Ges.*, 1873, 1129.) The author gives an account of the second large supply of cinchona barks from Java, consisting of 208 cases, which arrived in Holland in January 1873. *Cinchona Calisaya*, *C. Hasskarliana*, *C. officinalis*, and *C. Pahudiana*, correspond to the description given by the author in the previous year, though they were all thicker and of better appearance than those of the former supply. *C. Pahudiana* now shows deep transverse cracks, and *C. officinalis* has assumed a great resemblance to a true Crown Loxa bark. *C. succiruba* occurs in single and double quills, 20 centim. long, 1-1½ centim. broad, and 2-4 millim. thick; pale greyish brown externally, with transverse cracks and longitudinal furrows, slightly crusted with lichens, and breaking with an even fracture. They are red internally, and have a strongly bitter and astringent taste.

C. caloptera which appears for the first time, consists of quills 18-20 centim. long, and 1-1½ centim. broad, and densely covered with lichens, with but few longitudinal furrows and numerous transverse cracks. Colour, greenish grey externally, pale yellow internally, fracture even, taste more astringent than bitter.

The author's analyses show the following results:—

Cinchona officinalis.

Total amount of alkaloids 3.62 per cent.	{	2.21 Quinine = 3.01 sulphate.
		0.78 Cinchonidine.
		0.63 Conchinine, cinchonine, and amor-
		phous alkaloids.

Cinchona Hasskarliana.

Total alkaloids 2.46 per cent. . . .	{	1.06 Quinine = 1.44 sulphate.
		0.66 Cinchonidine.
		0.74 Cinchonine and amorphous alka-
		loids.

Cinchona Pahudiana.

Total alkaloids 1·19 per cent. . . .	$\left\{ \begin{array}{l} 0·47 \text{ Quinine} = 0·64 \text{ sulphate.} \\ 0·34 \text{ Cinchonidine.} \\ 0·38 \text{ Amorphous alkaloids.} \\ \text{Traces of cinchonine but no conchicine.} \end{array} \right.$
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Cinchona succirubra.

Total alkaloids 5·73 per cent. . . .	$\left\{ \begin{array}{l} 1·12 \text{ Quinine} = 1·52 \text{ sulphate.} \\ 3·10 \text{ Cinchonidine.} \\ 0·56 \text{ Cinchonine.} \\ 0·95 \text{ Amorphous alkaloids.} \\ \text{No conchicine, quinamine, or paricine.} \end{array} \right.$
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Cinchona caloptera.

Total alkaloids 2·77 per cent. . . .	$\left\{ \begin{array}{l} 0·73 \text{ Quinine} = 0·99 \text{ sulphate.} \\ 0·10 \text{ Cinchonidine.} \\ 1·06 \text{ Cinchonine.} \\ 0·88 \text{ Amorphous alkaloids.} \\ \text{Traces of conchicine.} \end{array} \right.$
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Cinchona Calisaya A.

Total alkaloids 3·5 per cent. . . .	$\left\{ \begin{array}{l} 0·61 \text{ Quinine} = 0·84 \text{ sulphate.} \\ \text{Much conchicine, cinchonine, and} \\ \text{amorphous alkaloids.} \\ \text{No cinchonidine, quinamine, or paricine.} \end{array} \right.$
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Cinchona Calisaya B.

Total of alkaloids 3·89 per cent. . . .	$\left\{ \begin{array}{l} 0·78 \text{ Quinine} = 1·07 \text{ sulphate.} \\ 0·03 \text{ Cinchonidine.} \\ \text{Much conchicine, cinchonine, and} \\ \text{amorphous alkaloids.} \\ \text{No quinamine or paricine.} \end{array} \right.$
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Cinchona Calisaya C.

Was not examined, as the available quantity was insufficient.

Cinchona Calisaya D.

Total alkaloids 5·75 per cent. . . .	$\left\{ \begin{array}{l} 2·35 \text{ Quinine} = 3·20 \text{ sulphate.} \\ 1·56 \text{ Cinchonidine.} \\ \text{Also conchicine, cinchonine, and amor-} \\ \text{phous alkaloids.} \end{array} \right.$
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Cinchona Calisaya E.

Total alkaloids 7·24 per cent. . . .	$\left\{ \begin{array}{l} 5·57 \text{ Quinine} = 7·62 \text{ sulphate.} \\ \text{Amorphous alkaloids.} \\ \text{Traces of cinchonine.} \end{array} \right.$
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A comparison of the above results with those of the previous year shows an increase of alkaloids in all the barks. But the percentage of quinine in A and B falls much short of that found in the corresponding barks of last year's importation, and these, as Howard supposes, represent the greater part of the *C. Calisaya* trees of Java. D and E, however, are most encouraging. The latter has been produced from seeds obtained from Bolivia, and, though not excelling in appearance, it contains the highest percentage of quinine yet found in any large quantity of bark. Hasskarl in his quarterly report on cinchona cultivation in Java (*Pharmaceut. Zeitung*, No. 59), says that barks of the same description as E have been found to contain as much as 10.9 per cent. of quinine = 14.67 per cent. of sulphate, and there is no reason whatever for doubting his statement. It is true that *Calisaya* barks of such quality are still comparatively scarce; yet it appears more than probable that the cinchona plantations of Java will before long produce results which may surpass the keenest expectations.

Cinchona officinalis, *C. Hasskarliana*, and *C. Pahudiana*, have all increased in quinine and decreased in cinchonine owing probably to suitable manuring.

Cinchona succirubra is rich in cinchonidine, the percentage of which increases with the progressive growth of the tree, at the expense of quinine.

Cinchona caloptera presents no favourable feature. It is bad in appearance, deficient in alkaloids, and seems to be wanting moreover in robust growth.

To summarize:—*Cinchona Calisaya* A and B, *Cinchona Hasskarliana*, and *Cinchona Pahudiana* remain very valuable medicinal barks; *C. Calisaya* D and E, and *C. officinalis* promise exceedingly well for the manufacture of quinine; *C. succirubra*, if improved in appearance, might find its way into the pharmaceutical markets, whereas *C. caloptera* seems to hold out no promise for the future.

Falsification of Cinchona Barks. By Prof. Bernatzik. (*Archiv. der Pharm.*, 3rd series, iv., 359, from *Zeitsch. des allg. oester. Apoth. Ver.*, 1873, No. 9.)

The fraudulent practice of impregnating inferior cinchona barks with an alcoholic or acetic solution of quinoidine was first pointed out by Hager (*Wittstein's Vierteljahrschr.*, xxi., 433), and is now confirmed by the author, whose attention was drawn to this fraud by the apparently enormous percentage of alkaloids and the resinous nature of certain barks. Finding Hager's method of detecting such an adulteration unsatisfactory, he used chloroform for ex-

tracting the artificially added quinoidine, as this substance does not dissolve even a trace of the alkaloids present in such barks; and having brought his experiments to a successful issue, he recommends the following preliminary test to be performed previous to the estimation of alkaloids. The ends of the longer pieces and those parts which on examination with the aid of a lens appear suspicious are separated, the thin quills unrolled, and broken so as to expose their inner surface, and all these parts reduced to fragments of not more than 1 centim. in length. Five grammes of the mixed fragments are packed tightly into a wide test-tube, covered with chloroform, and after half an hour's maceration and agitation, thrown upon a filter. The filtrate is evaporated to dryness on a watch-glass, the residue moistened with one or two drops of hydrochloric acid, then gradually mixed with water (1 to 3 c.c.), again filtered, and the filter washed with about 1 c.c. of water. If quinoidine is present the filtrate will show a distinct yellow colour, while a colourless filtrate will prove its absence. One half of the filtrate, if mixed with some solution of chlorine, and then with ammonia, will produce an emerald green coloration, even if the quantity of quinoidine be exceedingly small; but if its quantity amounts to $\frac{1}{2}$ per cent., a green flaky precipitate will be obtained, which dissolves in an excess of ammonia, forming a deep emerald green solution. The addition of a few drops of solution of caustic soda to the other half of the filtrate will produce a turbidity or a precipitate, disappearing on shaking with ether.

If no quinoidine has been thus detected, the fragments of bark exhausted with chloroform should be dried between bibulous paper, and exhausted with cold distilled water in order to dissolve the adhering salts of quinoidine. After macerating for half an hour, and filtering, the filtrate will be almost colourless if the bark was not adulterated, but will appear deep yellow if the bark was impregnated with salts of quinoidine. NaHO produces a precipitate soluble in ether, but not disappearing on agitation with chloroform, though the latter dissolves the quinoidine from it, and leaves it on evaporation in such a pure state, that the least trace of the residue dissolved in water with HCl will suffice to produce the most striking reaction with chlorine and ammonia.

It may occur sometimes that both the aqueous and the chloroform solution give but such faint indications of quinoidine that it becomes necessary to unite both, and to examine the mixture in order to obtain satisfactory results. In such a case, the aqueous solution is precipitated with NaHO , the precipitate agitated with chloro-

form, the latter separated, mixed with the original chloroform solution, and the mixture evaporated. The residue may then be tested as before.

The methods described may also be employed for the detection of a falsification of cinchona bark with cinchonine or cinchonidine in alcoholic or acetic solutions. It need hardly be mentioned that in such cases, the precipitate produced by caustic soda will not be soluble in ether; nor will solution of chlorine and ammonia produce a green coloration, unless the cinchonidine should contain quinine, which (as one of the isomers of quinine) gives the same reaction as quinine and quinidine.

Cinchona Barks. Microscopical Characters. H. Pocklington. (*Pharm. Journ.*, 3rd series, iv., 549.) As it is difficult to cut good sections of cinchona bark, on account of the toughness and distribution of the liber, the author recommends that the bark be kept in a damp place for a few days, when sections well adapted for the study of the various cell contents may be obtained with moderate ease.

Cinchonæ Rubræ Cortex. The prominent characteristics are numerous well formed and very tough liber cells. Occasionally, spiral or pitted cells are met with in the middle layers; and various somewhat unusual modifications of the ordinary type of bark structure, which, though probably occasioned by accidental causes, may be to some extent characteristic of the plant.

The author confirms Mr. Howard's statement, that numerous crystals are seen in the middle and inner portions of the bark, if sections be boiled for a short time in solution of caustic potash, and examined under a moderate power of the microscope; but he expresses some doubt as to their being crystals of the alkaloids of the bark, though their position, as regards the nature of the tissues in which they are most abundant, may support that view; for he has produced very similar crystals in sections of some other plants, especially of the common garden mint, and has always referred them to the action of the potash upon one of its colour elements.

The amorphous alkaloids described by Mr. Howard were repeatedly observed by the author in the barks of commerce, and most abundantly mixed with proteids and other substances in the petiole and young stem of the living plant. They differ much in their position in the plant from most other cell contents. Crystallized substances, resins, and oils are usually contained in special cells, associated more or less intimately with the fibro-vascular system, but these are found only in semi-specialized cells in the

parenchymatous tissues, and are transitional, undergoing modifications as the growth of the plant advances. They are very numerous in the medulla of the petiole, and in that of the growing shoot, but appear much more sparsely distributed in the medulla of the more mature stem, where they are chiefly confined to the sap-containing cells of the subcortical layers.

The outer corky layers of the bark vary little from the usual type of these layers; the parenchyma within them is composed of rather large, irregularly shaped cells, containing various granular substances and cinchona-red mixed with other colouring matters, a little starch, members of the tannin group chiefly localized near the liber and the boundary of the various years' growths, and, in semi-special cells, the amorphous alkaloids just named. The liber cells are distributed somewhat irregularly in the liber zone, are long, much consolidated, have successive deposits of hardening matter, easily seen by aid of a high power, and are curiously transversely marked, and somewhat furrowed at times longitudinally. All these characteristics are subject to endless variations.

Cinchonæ Flavæ Cortex. The differences between the structure of this bark and the structure of *C. rubræ cortex* are chiefly differences of degree rather than of kind, and can only be made clear by aid of numerous and accurate drawings. The bark is rather easier of examination, as there is little need for the removal of the colouring matter, which in the case of the red bark renders accurate observation a matter of difficulty.

The toughness of the liber and its feeble adhesion to the surrounding tissues are, however, more troublesome than in the other bark; but good sections can be obtained by soaking a piece of the bark for a number of hours in a warm strong solution of gelatine, and then removing the gelatine from the sections by soaking them in warm water.

The above remarks apply also, though with somewhat less force, to *Cinchonæ pallidæ cortex*, the structure of which may be regarded as a small and revised edition of the red bark without its colouring matters. The microscopic characters of this and the other barks are, as the author says, much better studied by the careful examination of specimens than from bare text descriptions of their structure.

The Characters, Properties, and Uses of Eucalyptus Globulus and other Species of Eucalyptus. Professor Bentley. (Abstract from the author's pamphlet.)

The discovery of the influence of eucalyptus trees in destroying or improving the pestilential nature of marshy districts would appear to be due to M. Ramel (who, as far back as 1856, forwarded

seeds of this tree to Paris), rather than to Sir W. MacArthur, to whom it is generally attributed. Among the various notices which have appeared, bearing testimony to the febrifugal property of the bark and leaves of this plant when administered internally, those of M. Gimbert have been more especially the cause of public attention being at the present time so particularly directed to the uses of this plant.

The *Eucalypti* belong to the natural order Myrtaceæ, and are all, with the exception of a very few, and in some cases doubtful, species, natives of Australia, where they are commonly known as gum-trees, or as stringy-bark trees. All the species have evergreen leaves, which usually (after the tree has arrived at a few years of age) hang in an oblique or even vertical direction from the branches. These leaves are commonly studded with internal glands or receptacles of volatile oil, as may be seen on holding them up to the light, when they present a semi-transparent dotted appearance. The flowers, which are usually pinkish or white, and which in some species yield a large quantity of honey, are frequently very beautiful, and have an agreeable odour. When of a white colour they much resemble myrtle blossoms, but are at once distinguished from these by the absence of petals, and by their peculiar calyx, which in the bud state is closed at the top by a little lid, which is thrown off as the flower expands. The fruit, which consists essentially of the hardened, somewhat globular or tubular calyx, contains a number of seeds, which considering the enormous size and height these trees sometimes attain, are extremely minute; as from one pound of seeds of the *Eucalyptus globulus* nearly 162,000 plants could be raised.

The *Eucalyptus globulus*, commonly known as the blue gum-tree, is a native of Tasmania, where it is more especially found on the damp slopes of valleys with a southern aspect. The foliage presents in a remarkable degree the changing aspect of the species of *Eucalyptus*. Thus, in young plants the leaves are of large size, sessile, placed horizontally on the stems and branches, and of a bluish glaucous white colour; but on plants varying from three to five years old, the leaves become narrower, of a bluish green colour, somewhat scimitar-shaped, and hang vertically or somewhat obliquely on the branches instead of horizontally. The flowers, which are large, axillary, and nearly sessile, grow singly or in clusters of two or three; before they expand, the flower-bud, covered by the lid or operculum of the calyx, has a rounded form; hence its specific name of *globulus*. It is extremely rapid in its

growth, and is, with the doubtful exception of the *Wellingtonia gigantea* (Lindley), the largest tree in the world. In some cases it has been known to attain the colossal dimensions of 350 feet in height, and 100 feet in circumference. Attempts have been made to introduce it into different parts of the globe, thought to be suitable for its growth and development; and it is now being cultivated successfully in various parts of Southern Europe, and of Africa and Asia. It seems to require a climate of which the temperature is never below the freezing point, and it is said that this tree is so tender when young, that even when sheltered from wind and cold it cannot resist a temperature lower than 27° F.

When the tree is about seven years old, it begins to yield a very abundant supply of seeds, which, owing to their natural dryness and minuteness, can easily be transported; and the seedlings, which require very little care, can be raised with great facility and quickness, and can be transplanted when about a year old. According to the *Gardeners' Chronicle*, published at Buenos Ayres, the best method and time of sowing the seed is under glass, either in a frame or by covering the box over with a piece of glass, and during the months of September and October; after they have attained the height of three inches, pot them off into small two-inch pots. When they have attained considerable strength, either shift them into larger pots, or plant them permanently in the ground, taking care that they are not exposed to any cold winds when young and tender, or the frost will be likely to kill them. The soil most adapted to the raising of these plants is a mixture of equal parts of vegetable mould, ordinary soil, rotten manure, and sand. When they are about three feet high, they are best planted in the ground. First dig a hole two feet deep by two feet across the top; put the best soil at the bottom. Let these holes be filled with water, or left open till after a heavy rain. Having put the best soil at the bottom, take the plants, spread out the roots, then put in the remaining soil, leaving a slight hollow so that the rain may penetrate after each shower. When they begin to grow fast, drive in three stakes across each other near the bottom of the stem, in the form of a triangle, placing some hay round the stem, and a piece of wire to secure the stakes round the tree; in this way the trees are quite safe from being blown down, and are not injured by the string being left round them too long.

These directions will of course require modifications in different countries and circumstances. Ordinarily in this country *Eucalyptus* seeds are sown in a mixture of loam, peat, and ordinary soil, with a

sprinkling of sand on the surface, and are readily raised in a greenhouse.

The properties and the uses of the *Eucalypti* are both various and numerous. The first and most important influence which this tree exerts, and that which has brought it more especially into notice, is its power of destroying the malarious agency which is supposed to cause fever in marshy districts. This it probably effects by draining the ground with its far-spreading roots, which act like a sponge; and also by emitting odorous antiseptic emanations from its leaves, although it is very probable that the influence of the latter is but small. It is stated that a *Eucalyptus* tree absorbs as much as ten times its weight of water from the soil. Many instances are given by the author of marshy and unhealthy districts having been drained and rendered salubrious by the planting of *Eucalyptus* trees.

The timber of many species of *Eucalyptus* is very valuable, owing to its solidity, hardness, and durability, and to its power of resisting the attacks of insects and the influence of moisture. Among the products obtained from *Eucalyptus* wood, we must not forget that of potash, of which it yields as much as 21 per cent., being double the quantity yielded by the elm or maple, which are the trees most esteemed for the manufacture of this article.

The barks of various species are also now used to some extent in paper-making; those of *E. rostrata*, *E. obliqua*, *E. corymbosa*, and *E. goniocalyx* are amongst those so employed. Good writing-paper has also been made from the bark of *E. obliqua*. The barks of many species are also extensively used for tanning, owing to the presence of similar constituents to those contained in oak-bark, and other substances, commonly employed for a like purpose.

A number of species of *Eucalyptus* also exude a very astringent substance, which, from its resemblance to the medicinal kino, both in appearance and properties, is commonly designated as *Eucalyptus*, or *Botany Bay kino*. This substance, which, when it first exudes, trickles like blood down the bark of the trees in a semi-fluid state, ultimately hardens into dark red shining masses, which have a very astringent taste. It is employed for similar medicinal purposes as our officinal kino, and also for tanning and dyeing, and is derived from *E. resinifera*, *E. globulus*, *E. corymbosa*, *E. rostrata*, and *E. citriodora*.

Another substance, called *Eucalyptus* or *Australian manna*, is also yielded by *E. mannifera*, *E. viminalis*, and probably other species. Two varieties of this manna have been distinguished, one of which

is in small, rounded, opaque, whitish masses, with an agreeable sweet taste. It has a similar action to the ordinary manna in use in this country, and contains somewhat similar constituents. It exudes abundantly during the summer months through punctures or wounds made in the leaves and young bark. As it exudes it hardens, and drops from the leaves on to the ground in pieces sometimes as large as an almond.

Another very important produce of the *Eucalypti* is the essential oil, which may be obtained in large quantities by aqueous distillation from the leaves. This oil is stored up in the pellucid glands already referred to as contained in the leaves, and readily observed when these are held up to the light by the semitransparent appearance they then exhibit. They generally have a somewhat camphoraceous smell; but the odour differs in the various species, and the oil obtained from *E. citriodora* has a pleasant citron-like odour. Some of these oils have been employed, as that of *E. oleosa*, as a solvent for resins in the preparation of varnishes; but they are of far more value for diluting the more delicate essential oils used in perfumery. The oils of *E. amygdalina*, *E. globulus*, and *E. citriodora* are thus more especially employed.

The oil consists chiefly of a substance, called by its discoverer, Mr. Cloez (who made some interesting researches on the essential oil of *E. globulus*), *eucalyptol*, a liquid body, in chemical characters resembling camphor.

Most of these eucalyptus oils are of a yellowish colour, although some have a bluish tint. By redistillation the oil may be obtained nearly colourless.

From the quantity of oil contained in the leaves, they yield, when burned, a very large proportion of gas, which is stated to produce a very brilliant flame. As much as 10,000 cubic feet of gas have been obtained from one ton of leaves.

As already noticed, the febrifugal properties of the bark of *Eucalyptus globulus* have been testified by many practitioners. It is said to be a valuable remedy, more especially in intermittent fevers and bronchitis. Several elegant preparations of the leaves and bark, such as the tincture, fluid extract, syrup, extract, lozenges, and pills, have been already prepared.

Probably some of the exaggerated statements that have been made in reference to the efficacy of *Eucalyptus* bark and leaves in fevers have arisen under the mistaken idea that the bark contained an alkaloid resembling, if not identical with, quinine. But the experiments of Mr. Broughton, the government chemist of Oota-

camund, entirely disprove this; for upon careful examination of the bark and leaves, Mr. Broughton states that neither quinine nor the other alkaloids of cinchona bark, as quinidine, cinchonine, or cinchonidine, exist in the plant in any proportion. What properties the plant possesses would appear therefore, so far as known at present, to be due essentially to the presence of eucalyptol, already noticed as the principal constituent of eucalyptus oil. From the testimony of numerous medical practitioners, and from the popular reputation of this plant in fevers in Australia and other countries, we can scarcely doubt that it does possess antiperiodic properties, although these are far less important than those of cinchona bark.

In making preparations of eucalyptus leaves, the narrow leaves should alone be used, as recent investigations have shown that these are far more efficacious than the broader leaves found on the younger and faster-growing herbaceous shoots.

Dr. Gimbert has also recently introduced a new method of dressing wounds by using eucalyptus leaves instead of lint. The leaves are simply laid on the wounds; and it is said that their balsamic nature not only cures, but removes all the unpleasant odour. Another way of using eucalyptus leaves is in the form of cigarettes, which are reputed to be efficacious in bronchial and asthmatical affections, and in other cases.

*List of the most important Publications having reference to the
Eucalyptus globulus.*

1. **F. W. Lorinser**: Wiener med. Wochenschrift, xix., 43, 1869; xx., 27, 1870.
2. **C. Haller**: Wochenblatt der Wiener Aerzte, xxvi., 25, 1870.
3. **Seitz**: Bayerisches ärztl. Intelligenzblatt, No. 24, 1870.
4. **Const. Paul et Gubler**: Gazette méd. de Paris, 20, 1870.
5. **L. A. Buchner**: Neues Repertor. f. Pharm., xviii., 551, 1869.
6. **Gubler**: Bulletin gén. de Thérapeutique, lxxxi., 4, 30, Août, 1871; 5, 15, Sept., 193, 1871.
7. **Régulus Carlotti**: L'Eucalyptus globulus, son rang parmi les Agents de la Matière Médicale. Ajaccio, 1872. Peretti, Libraire. 8vo, 51 pp.
8. **Gimbert** (de Cannes): L'Eucalyptus globulus, son importance en Agriculture, en Hygiène, et en Médecine. Avec trois planches. Paris: Adrien Delahaye. 1870. 8vo, 100 pp.
9. **Debray**: De l'Eucalyptus globulus. Paris: Adrien Delahaye. 1870. 8vo.



EUCALYPTUS GLOBULUS.*

* From the *Archiv. der Pharm.*, 1873, p. 129.

10. **Cochet**: de l'emploi de l'accolature et de l'eau distillée de l'*Eucalyptus globulus* pour le pansement et la désinfection des plaies. Bull. gén. de Thérapeutique, 9 livraison, p. 422. 1872.

11. **Tristany**: El Compilador Medico. 1865.

12. **Miergus** (de Bouffarik): Journal: "La Science pour tous." 15 Janvier, 1870.

13. **Adrien Sicard**: Bulletin de la Société zool. d'Acclimatation. Janvier, 1868.

14. **Rabuteau**: Bull. gén. de Thérapeut., lxxxiii., 12, p. 549. 1872.

15. **Duguesnet**: do., lxxxi., 12 livraison, p. 556. 1871.

16. **Stanislas Martin**: do. lxxxiii., 10 Novembre, p. 453. 1872.

17. **Bohn**: Berlin. klin. Wochenschrift. No. 9, p. 110. 1872.

18. **Maclean**: The Practitioner. November, 1871.

19. **Strube**: Berlin. Klin. Wochenschrift, xxix., No. 52, p. 628. 1872.

20. **J. Aron**: Recueil de memoires de méd., etc., et pharmacie militaire. No. 152, Janvier, 1873.

21. **H. Kœhler**. *Eucalyptus globulus*. Archiv. d. Pharm., 3, iii., 126.

22. **Raveret-Wattel**: L'*Eucalyptus*. Bulletin de la Société d'Acclimat., 1871-72.

23. **Bentley**. Pamphlet on the Characters, Properties, and Uses of *Eucalyptus globulus*, and other Species of *Eucalyptus*. April, 1874.

Hydrastis Canadensis. Presence of a third Alkaloid. A. K. Hale. (*Amer. Journ. of Pharm.*, vol. iii., No. vi., 241.) The author's investigation of the root of *Hydrastis Canadensis*, or golden seal (natural order, Ranunculaceæ), led to results which strongly point to the existence therein of a third alkaloid, in addition to berberina and hydrastia previously discovered in the same.

After removing the berberina from the watery percolate as a hydrochlorate, and precipitating hydrastia by careful neutralization with ammonia, the addition of an excess of ammonia throws down another precipitate, more resembling berberina than hydrastia, but yet decidedly different from the former. The following is an account of Mr. Hale's experiments:—

He treated the powdered root of *Hydrastis Canadensis* in a percolator with distilled water, until the strength seemed to be exhausted; then he removed the berberina as a hydrochlorate by the addition of hydrochloric acid. Removing this precipitate of hy-

drochlorate of berberina by filtration, he then proceeded to obtain the hydrastia by adding solution of ammonia (10 per cent.), until a precipitate ceased to be thrown down. This precipitate was separated by filtration, and dissolved in and crystallized from alcohol, when, contrary to the description given in the books, he found that the characteristic prisms of hydrastia were coloured by and intimately mixed with a yellow powder, which he supposed to be berberina that had not been thrown down as a hydrochlorate.

Being thus a little disconcerted at not obtaining the result hoped for, the author made another percolate of the drug, and cautiously neutralized the mother-liquor of berberina with a 10 per cent. solution of ammonia. The precipitate thus obtained was dissolved in and crystallized from alcohol, which furnished beautiful and well defined prismatic crystals of hydrastia, free from yellow colouring matter at all resembling berberina.

The neutral mother-liquor of hydrastia was now mixed with solution of ammonia (10 per cent.) to a strong alkaline reaction. This gave a yellow precipitate, which was separated, and found to correspond with the yellow powder above mentioned, as accompanying the first attempt to obtain hydrastia, and to be darker in colour than berberina, and to possess the following reactions. When dissolved in alcohol, it has a neutral reaction with a solution of litmus.

Taking corresponding proportions of berberina (designated by *a*) and the new substance resembling berberina (designated by *b*), and applying a few reagents, the following results were obtained:—

In cold nitric acid *b* is the less soluble, and both form red solutions when the acid is heated. In water, at 60.°F., *b* is the less soluble; both dissolve in hot water. In hot sulphuric acid, *a* gives a yellow solution; *b* a reddish brown solution. In cold solutions of caustic potassa, *a* is the more soluble. When heated in hydrochloric acid, *a* furnishes the darker solution; and when the hot hydrochloric acid solutions are allowed to cool, *a* crystallizes while the solution is still warm, giving an abundant crop of bright yellow needles, while *b* remains in solution until nearly or quite cold, and then only crystallizes sparingly in darker and larger needles than *a*.

Dissolved in warm water, and tested with iodohydrargyrate of potassium, *a* gives an abundant yellow precipitate, while the precipitate furnished by *b* is less abundant, and of a very light yellow, almost straw-colour.

Fearing *b* might be a modification of *a* by the action of ammonia,

the author subjected *a* to the influence of ammonia for several days, but observed no change. Obtained as above described, *b* exists in *Hydrastis Canadensis* in less quantity than hydrastia.

Polygonum Aviculare. Note on its reputed Value for Stone. J. R. Jackson. (Abstract from a paper in the *Amer. Journ. Pharm.*, 1873, 247; *Pharm. Journ.*, 3rd series, iv., 105.)

Members of the order Polygonaceæ are far from being rare, either to the British, Continental, or American botanist; least of all, perhaps, is the knot-grass (*Polygonum aviculare*), which generally flourishes best where its presence is not wanted, and defies eradication. With such quantities of this weed at our very door, it seems somewhat ludicrous to import it from ever so short a distance, let alone from Russia; but such is the case, that amongst the numerous contributions of vegetable products, "good, bad, and indifferent," which are constantly being received at Kew, a bundle of knot-grass recently arrived from Bordiansk, with a wonderful account of its extraordinary power of curing stone and gravel diseases. Our correspondent says his attention was attracted to it by a case which fell under his own observation—that of a man who suffered so excessively that he was told by the doctors he must undergo an operation. In the meantime, a quantity of polygonum was given him by a person who happened to hear of the case, the sufferer drank two tumblerfuls of the decoction, and, in about fifteen minutes, he felt an intense pain in the bladder and surrounding regions, as if the parts were being torn to pieces. This was immediately succeeded by an irresistible desire to pass water, which was done with great pain, but nothing could check the force of the bladder in ejecting the water, which brought away with it a great quantity of gravel and bits of stone; some of the pieces passed were very large, but the instant they came out they opened into flakes, and broke up into thin plates. The man is stated to have quite recovered, and the person who gave him the polygonum is said to have been distributing it in all such cases that have come under his notice for the last thirty years, and always with success.

The following is given as a suitable way of taking the medicine. Take a good, liberal handful, and boil gently in three pints of water, till it is reduced to about two pints. The dose is one or two tumblerfuls to be taken in the morning on an empty stomach. In bad cases it is given several times throughout the day, but diet must be strictly kept. As a purifier of the blood, one tumblerful of a weaker decoction is recommended to be taken every morning.

The discovery of such an apparently valuable medicinal agent by

any one not sufficiently acquainted with plants to recognise it, must have been a source of much gratification. Emetic, cathartic, and diuretic properties have been ascribed to many of the Polygonæ, and even to *P. aviculare* itself. At one time it was stated that the plant was an excellent febrifuge, and it was used in Algeria, and other parts of Africa, as a substitute for quinine. In 1845, a French doctor reported upon it as being an excellent remedy for chronic diarrhœa, the means of applying it being in form of a strong decoction.

At the present time the only really valuable medicinal product of the Polygonæ is rhubarb.

Examination of the Nut of Bertholletia Excelsa. By B. Corenwinder. (*Pharm. Journ.*, 3rd series, iv., 86; from *Journ. de Pharm. et Chim.*, 4th series, xviii., 14.)

The *Bertholletia excelsa*, which belongs to Schomburgk's section Lecythideæ of the natural order Myrtaceæ, was first described by Humboldt in his work, "*Des Plantes Equinoxiales.*" This gigantic tree presents in its fruit,—a kind of rounded pericarp of thick wood which contains triangular seeds,—a most remarkable example of the power of organic force. It grows abundantly on the banks of the Orinoco, and in Brazil, attaining a height of 33 metres (108 feet) and even more. Its trunk is straight, cylindrical, and about 9 decimetres in diameter; the leaves as well as the branches are alternate. The fruit is a spherical nut about the size of a child's head, divided internally into four cells, each containing several seeds. These number from six to eight in each division, and are monospermous; obtusely triangular in shape, tuberculate, and of a cinnamon colour. The pericarp, which is hard and woody, contains an oily kernel, which when fresh has an exquisite flavour, but quickly turns rancid. The fruit has hitherto presented little of interest in an economic point of view, but the author was led to analyze it during some researches upon oleaginous seeds.

The study of the reproductive organs of vegetable life is full of charms for the chemist who has a love for nature. Just as the milk of mammals,—composed of casein, sugar, butter, albumen, and phosphates,—is the type of animal alimentary matter, so in fruits, in seeds, nature has condensed the immediate principles which by germination undergo modifications rendering them soluble. They constitute then a vegetable milk which contains oil, sugar, nitrogenous substances, and the phosphorus necessary to stimulate and maintain the life of the plant. — These principles are found in all seeds, but in varying proportions; though doubtless there reigns a harmony and

concordance between these proportions and the medium in which the young plant is born and developed.

The elements which constitute the seed have probably special destinations. M. Corenwinder thinks that the oil supplies, by its combustion, the initial heat necessary for the excitation of life, and supports his hypothesis by the fact that in maize grains, amongst others, the oil is contained in cells which immediately surround the embryo. When favourable circumstances, such as humidity and warmth, provoke the first symptoms of germination, the tissues swell, the fatty matter burns slowly, absorbing oxygen and disengaging carbonic acid; and the vegetable foetus, excited by a gentle heat, commences to grow. In a later phase of the phenomenon, the starch of the perisperm is transformed into sugar; the nitrogenous materials and phosphates present are dissolved in the weak acid which is developed by chemical action, and the milk of the young plant is constituted.

The experiments of the author were made with nuts in a fresh state, to which he attributes the following composition as representing the kernels in the normal state :—

Water	8.00
Oil	65.60
Nitrogenous matters	15.31
Non-nitrogenous organic matters	7.39
Phosphoric acid	1.35
Lime, potash, silica, etc.	2.35
<hr/>	
	100.00

These figures compared with the following composition attributed to the ground-nut (*Arachis hypogæa*) by the author show that in the seeds of the *Bertholletia excelsa* there is a larger proportion of oil, but the nitrogenous matter is less abundant.

Analysis of Ground-Nut.

Water	6.76
Oil	51.75
Nitrogenous matter	21.80
Non-nitrogenous organic matter containing starch	17.66
Phosphoric acid	0.64
Potash, chlorine, magnesia, etc.	1.39
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	100.00

The proportions of phosphoric acid found in the perfectly white ash of these two nuts were as follows :—

Brazil-nut	36.54 per cent.
Ground-nut	31.53 „

In Brazil and Guiana an excellent edible oil is extracted from the fresh Brazil-nut; it is possible, however, that the facility with which these nuts turn rancid has helped to deter European manufacturers from attempting to utilize them for such a purpose. But even if it were not possible to procure supplies of the nuts sufficiently fresh for the purpose in Europe, the author considers an oil might be obtained from this source suitable for the manufacture of soaps and other industrial purposes; while the oil-cake might be advantageously used as manure or perhaps even as a food for cattle.

Vesicating Insects. Dr. Fumouge. (From *The Practitioner*.) Vesicating insects live in all parts of the globe, and more especially in the hot and temperate climates, and there is not perhaps a people unacquainted with their properties and modes of application. In Europe, one kind is more particularly employed; namely, *Cantharis vesicatoria*. It is pre-eminently the vesicating insect, or at least the one which holds the first rank in European pharmacopœias. And yet it would be a mistake to conclude from its place in the materia medica that it possesses vesicating properties in the highest degree; it will be seen further that it is not so. Its vesicating properties are certainly quite sufficient for the wants of therapeutics, and this explains how its use has become so prevalent; but if it is so employed in preference to other more vesicating insects, it is so principally because it is more easily gathered. Cantharides, as is well known, alight in swarms upon certain trees; it is therefore possible to collect thousands of them in a few instants, whilst this is not the case with other vesicating insects. Sometimes, as with the meloës, it is even necessary to catch them one by one; and it follows that, being thus gathered, they are far more expensive than cantharides.

This is the cause of the almost exclusive employment of cantharides in pharmacy, where they have superseded the use of meloë and mylabris even in the countries where these were formerly employed.

There is, however, one mylabris, the *Mylabris Sida*, better known commercially by the name of China mylabris, which for several years has reached us from China in pretty large quantities, and may be procured in the London Docks. This insect affords on analysis as much cantharidin as cantharides; but as it is less abundant in

fatty matter, it is not as suitable as cantharides for the preparation of vesicating plasters.

The percentage of cantharidin in the vesicating insects varies considerably, and it is to be regretted that so little is known as to their relative degree of strength.

The *Meloë Majalis* is perhaps of all sorts the one which contains the most cantharidin. According to the author's analysis it contains 12 parts to 1000. It is, therefore, not allowable to substitute it for cantharides in pharmaceutical preparations, as this latter insect only yields 4 parts of cantharidin to 1000, or 5 parts at the maximum.

The China mylabris contains as much cantharidin as cantharides do, but for reasons above stated it cannot be used with advantage instead of cantharides in the preparation of vesicating plasters. Thus neither the meloë nor the mylabris can at present take the place of cantharides in pharmacy. But even the latter ought not to be employed without due caution, as they do not always contain the same quantity of cantharidin, and may be adulterated, as happens more frequently than is suspected. To know their proportion of active principle a careful analysis is the only resource the pharmacist has. The following is the *modus operandi* recommended by the author for such a determination.

One hundred grammes of the powdered cantharides are placed into a percolator, and exhausted with three successive portions of chloroform, each portion being kept in contact with the powder for 25 hours, before the tincture is drawn off. The united tinctures are then distilled to recover the chloroform; the extract obtained is agitated with bisulphide of carbon, the mixture filtered, and the cantharidin remaining on the filter washed with some bisulphide of carbon. Thus obtained it is not perfectly pure, but it is quite pure enough for us to judge of the therapeutic and commercial value of the cantharides examined.

A number of such determinations, conducted by the author, showed that the French Codex has adopted too high a figure in fixing at 5 per cent. the minimum quantity of cantharidin contained in cantharides of good quality. It ought to have fixed upon 4 per cent., and perhaps even upon 3 per cent., as cantharides containing only this amount appear to be quite strong enough.

It is surprising to see that the authors of the French Codex and those of the British Pharmacopœia do not recommend to prepare tincture of cantharides from cantharides of a standard quality, so as to cause this preparation to present invariably the same proportion of cantharidin.

The following table will show that the proportion of cantharidin in cantharides may vary from 1.75 to 5 per cent.; it need hardly be pointed out how untrustworthy a medicament is prepared with a fixed quantity of a substance, the active principle of which may vary in such a degree. The case is more serious still if the preparation is prescribed internally.

Origin of Cantharides.	Quantity Used.	Cantharidin Obtained.	Cantharidin contained in 1000 Grammes.
	Grammes.	Grammes.	Grammes.
1. Cantharides from France, 1866	100	0.48	4.80
2. " " " "	"	0.275	2.75
3. " " Germany, "	"	0.435	4.35
4. " " Trieste, "	"	0.50	5.00
5. " " France, 1865	"	0.375	3.75
6. " " Germany, "	"	0.215	2.15
7. " " " "	"	0.17	1.70
8. " " " 1866	"	0.48	4.50

The requirement of a standard quality of cantharides would be equally desirable for the preparation of blisters or epispastic papers.

The vesicating tissues prepared with cantharidin have until now been very unsatisfactory. The surface easily breaks, and they soon lose their properties, owing to the spontaneous volatilization of the cantharidin. Cantharidate of potash has been recommended in preference, as presenting greater stability; but whatever its merits in this respect may be, it is obvious that if tissues thus prepared do not blister more quickly than those made with cantharides, there can be no advantage in using the much more expensive cantharidate of potash.

Niin of Yucatan. M. Blode. (*Neues Jahrb. der Pharm.*, xl., 234; from *Report of the Amer. Pharm. Assoc.*)

This is the name of the insect belonging to the genus *Coccus*, order Hemipteræ, which occurs on a species of *Spandias* (order Anacardiaceæ). On throwing the insects into hot water a fatty substance rises to the surface, which is skimmed off and used for plasters and ointments. It has the consistence of suet, a specific gravity of .92, and is soluble in ether, turpentine, benzol, chloroform, and boiling alcohol. It consists of oleine, stearine, and palmitine. Upon saponification it yields a volatile pungent acid which the author has called niic acid, and which differs but little from hircic acid.

Note on Aloes. Edward R. Squibb, M.D. (*Pharmacist*,

1873, p. 33). A pretty close examination and cross-examination of the aloes of the commercial market during the past four years, has led the writer to the inference that the differences in it are due quite as much to difference in mode of preparation as to difference in species, climate, etc. Comparing the varieties of the market with the uses and effects of the drug, without too much dependence upon the books, it will be found that there are two distinct classes.

Between the classes there seems to be a pretty sharp line of difference, while the individuals of each class shade off into each other without any well-marked boundary line. The prominent and perhaps characteristic difference between the two classes of the drug is, that in their therapeutic effect one is comparatively mild and gentle and unirritating, with tonic and aromatic qualities, while the other is more harsh and drastic, producing more irritation, and much more liable to overaction. This difference adapts the individuals of the first class better to use in human beings, and renders a selection for the mildest among the individuals very desirable, if not necessary, in the delicate organization of women, in the treatment of whose diseases this drug is so important and so valuable. The individuals of the second class are better adapted to the medication of animals, and by right should not be used for mankind.

Carrying this therapeutic distinction into the drug market, and applying closely, the two classes will be easily made out by a marked difference in the sensible properties. The one class is of a lighter colour, generally soft, and often semi-fluid in consistence, and varying in both colour and consistence with length of exposure to the air, and with temperature. The odour is entirely different both in quality and degree: being aromatic in quality and feeble in degree. When strong, and approaching to the character of a stench, as it not unfrequently does, this may arise from decomposing animal matter, such as goatskin, fragments of which are often found in the aloes. From the appearance of these fragments of skin, and fragments of the aloe plants, and from the presence of uncoagulated albumen, it seems almost certain that the individuals of this class have not been subjected to artificial heating, but that the exuded juice is dried in the sun, perhaps in goatskins, which line a shallow excavation made in the sand at the stump of the plant, whose leaves may have been cut off near the ground, and laid with their exuding cut ends over the goatskin.

The second or more drastic class affords equal evidence of being prepared by artificial heat, and the depth of colour to some extent indicates the amount and quality of the heat used. Most, but not

all, the varieties of this class give evidence of being made by decoction of the plant, rather than by evaporation of juices obtained by exudation from the fresh plant.

All the individuals of the first class are known in the market as Socotrine aloes, or occasionally as East India aloes. While the second class has no generic or class name, but embraces the individual varieties which come from the West India islands, and from Eastern and Southern Africa. This group is well represented by the commercial titles, Barbadoes aloes, Cape aloes, etc., and each of the two names mentioned covers, in the market, sub-varieties produced neither in Barbadoes nor in the Cape of Good Hope.

While some of the varieties of this class are occasionally met with which are very aromatic and very nice, giving evidence of careful preparation, this is so rare an exception that it does not modify the judgment of the writer to the effect that the whole class should be excluded from the materia medica and pharmacy which is specially applicable to mankind, and be confined to the larger uses of veterinary practice, where it has special and very important advantages over the other class.

The so-called Socotrine aloes varies quite as much, though all under one name, as the other class with its various names; but of late years there is a growing tendency in the market to separate it into two sub-varieties by difference in colour, so that it is not uncommon to hear of red Socotrine aloes and yellow Socotrine aloes, the red variety being justly held in the highest estimation. A curious observation, often verified by the writer, is that the red variety is always yellow at first, and gradually changes to red through intermediate shades, by age and exposure to the air; and that continued exposure tends constantly to deepen the red colour into garnet at first, and finally into reddish-black, when the edges are no longer translucent. The yellow sub-variety, however, does not become red by age and air-contact, but only deepens, as it dries and becomes brittle, into a yellowish liver colour, or yellowish-brown, with very little of the red tinge, or none at all. This yellow sub-variety it is in which the foetid, stinking odour is occasionally met with, and as both sub-varieties are of the same yellow colour at one early stage even of their drug market career, and at this stage distinguishable chiefly by odour and visible impurities, the question arises as to whether both are not from the same source, and the same process of preparation,—the parcels which become red being well and carefully prepared, while the parcels which do not become red, may, from containing putrescible matter, undergo a fermenta-

tion which may destroy the elements upon which the red colour depends, and other more valuable qualities, as the aroma, etc.

The foetid odour of this sub-variety is always diminished by age, and is altogether lost in the powder made from it.

As a general rule this Socotrine aloes is much higher in price than any of the grades of aloes by decoction, and loses much more largely by drying. All except the finer parcels of the red variety require to be melted, diluted, and strained, before they are fit for medical use, and the loss by straining varies very much, say from 5 to 10 per cent. It is curious to notice how small a proportion of these impurities is visible by inspection of the aloes beforehand. The average loss from straining and drying is perhaps 15 to 18 per cent. but has, in the writer's experience, once reached 27 per cent. upon a large lot. The substances separated by straining through a sieve of sixty meshes to the linear inch, are chiefly pieces of goat-skin, shreds of the aloe plant, sticks, small stones, and hair. A specimen of these strainings is presented herewith. Exceptionally entire goatskins are found in the parcels, and one is here shown tied up at the openings, showing how the juice is transported to the packing places. One outlet—the neck—appears to have been left open, as in the transportation of grape-juice from the wine-presses, through which to pour out the contents. After being emptied—for it was found empty—this skin appears to have been dropped into the package of aloes, possibly by some child, as the skin is smaller than others which have been met with. From another parcel a rude knife of very peculiar shape and construction was strained. This knife, as shown, was probably used to cut off or incise the leaves of the plant, though it does not appear to be particularly well adapted to such purpose for civilized hands. The above figures are given from an experience of straining, drying, and powdering more than twenty-two thousand pounds of Socotrine aloes.

The melting, straining, and drying of the aloes by artificial heat is very injurious to it, of course; as in proportion to the want of skill and care with which this is done, it degrades the aloes to the character of the lower grades made by decoction. But when the question is reduced down to a choice between the injury done and the common practice of drying on steam tables without straining, and thus powdering up goatskin, stones, sticks, etc., there can be no doubt as to which course is best for the interests of medicine. The finer packages of red Socotrine aloes, which always command a high price but are slow sale, contain so little of impurity which can be separated by a No. 60 sieve, that as a rule it is better to use it

without this hurtful process. Spread thinly out upon shallow trays of tinned iron, the advisability of straining can be approximately and usefully judged. And if this be done in cold weather, when the aloes does not run, and when the air is comparatively dry, a couple of months' exposure, at ordinary temperatures, is sufficient to dry the aloes well, retaining its natural aroma to a highly desirable and useful extent. It is very much to be feared that the use of such aloes in the officinal formulæ is very much undervalued, since the Socotrine aloes which has passed through the writer's hands within the past ten years has been very nearly all used by successive crops of quack pill men, who must have good drugs while getting up the reputation of their nostrums, though this may not be the time when the money is made. Pharmacists, as a class, use very few such drugs, because, not knowing their value, they will not pay the price.

Rhizoma Chinæ. Dr. O. Th. Sandahl. (*Neues. Jahrb. f. Pharm.*, xxxix., 2; from *Nord. Med. Archiv.*, iv., 3.) The *Radix Chinæ* of old pharmacopœias has been displaced by the *Rhizoma Chinæ* of the modern ones; but the author shows that this drug is neither a root nor a rhizome, but a tuber, although it is destitute of the so-called eyes. The nature and arrangement of its elementary tissues show it to be an underground stem, and not a root, while the copious depositions of starch in its ramifications, and the consequent swellings in the latter are characteristic of a tuber. These tubers are, however, not obtained from *Smilax China*, as was formerly supposed, but from *Smilax glabra*, as was lately proved by Dr. Hance, who received a living plant, with the subterraneous parts attached, from Mr. Bowra. Dr. Hance also calls attention to the fact that in all countries the roots, etc., of various species of *Smilax* are held in high repute for their alterative, diuretic, and diaphoretic virtues, and argues from this that sarsaparilla and Smilacææ may not be as ineffective as many physicians suppose.

Koussine. Dr. C. Bedall. (*Archiv. der Pharm.*, 3rd series, iii., 251; from *Schweiz. Wochensch.*, 1873, Nos. 9 and 10.) Pavesi states that the active principle of koussou which he isolated, and to which he gave the name koussine, occurs only in the pollen.

The author has found, however, that this substance is not confined to the flowers, but that it is also contained in the stem and leaves, though in smaller quantities. Pavesi's method of preparing it seems to him the simplest and best. The koussou is repeatedly exhausted with a weak alcoholic solution of caustic potash, the residue boiled with water, the decoction mixed with the alkaline

alcoholic tinctures, the mixture filtered, the alcohol removed by distillation, and acetic acid added to the remaining liquid. Koussine is thus thrown down as a white flocculent precipitate, which soon assumes a resinous appearance, and becomes yellow on drying. If thus carefully prepared and dried, it is a yellowish or yellowish white powder of a peculiar odour, and a strongly bitter and acrid taste. Microscopically examined, it appears crystalline, without however any definite shape. It is but sparingly soluble in water, but readily soluble in alcohol, ether, and fixed alkalies. It contains no nitrogen, its formula being $C_{26}H_{22}O_5$.

Origin of Frankincense. J. B. Batka. (*Amer. Journ. Pharm.*, 3rd series, vi., 266; from *Buchner's N. Repert.*, 175-177.)

The author stated at the last meeting of German naturalists and physicians, that the commercial olibanum is not obtained from *Boswellia glabra serrata* or *papyrifera*, but, according to Birdwood, from *B. Carteri*, which, in Soumali, is called mohr madow, and from *B. Bhau* (dajana mohr add), and *B. Freriana* (yegaar); all growing upon lime rocks in Soumali, the first one also in Hadramout. These statements have been corroborated from Aden, by Baron Maltzahn.

Note on Ergot and its Preparations. Dr. E. R. Squibb. (Paper read before the Amer. Pharm. Assoc., at Richmond, Va., September, 1873.)

There is, perhaps, no better example of the unity of pharmacy with practical medicine than is seen in a review of the career of ergot in the materia medica. The relation is a closer one than that of interdependence, and the support of a common interest from different bases of support. It is rather the relation of a single cause to a single effect. If knowledge and progress in medicine may be represented by light, then the correlation of electricity, magnetism, and heat in lighting up the universe may not unfairly represent the correlation of pathological research, chemistry, and pharmacy in therapeutics.

From 1807, when Dr. Stearns, of Saratoga County, recalled professional attention to its use in medicine, its history in the materia medica is most varied and interesting; and, from a simple parturient and supposed example of a specific effect upon a single organ, it has come to be applied upon a broad general principle, and is already sufficiently studied to extend its utility beyond anything that could have been foreseen. If the influence of pharmacy could be subtracted from this beneficent result, as it cannot be, it is highly probable that the remainder would be comparatively

small. The ergot in substance, or by infusion, or by tincture, could have advanced slowly, if at all, to the present state of knowledge in its application. Professor Proctor, in a paper published in the "Proceedings of the American Pharmaceutical Association," in 1857, p. 127, was the first to give uniformity and permanence to any preparation of ergot; thus rendering its systematic and accurate administration practicable by so simple a proceeding as the addition of an acid to preserve it from those changes and uncertainties which, for half a century, had stood in the way of any very accurate investigation of its nicer therapeutic effects. Various investigations, chemical and pharmaceutical, had gradually led to this, but the various extracts, fluid and solid, and the various preparations under the name of ergotin, had all seemed to partake of the perishable nature of the drug in substance, so that the administration could be neither accurate nor uniform. And without this factor of tolerably fixed and known quantities in dosing, effects must always be liable to such confusion and uncertainty as to render the difficulties of accurate investigation almost insurmountable.

Although it may be quite true that when the life of one or the lives of two human beings depend upon the parturient effects of a dose of ergot, there is no better practice, nor any that is so safe, as the use of fresh ergot in freshly made powder; yet experience has abundantly shown that it is upon the age and condition of the ergot, rather than upon its being ergot, that the safety depends; and that this age and condition can rarely be known with that certainty which is necessary when human life depends upon it. Hence it is that the elements of greatest importance in the use of ergot, as indeed of the whole *materia medica*, are to get the drug in good condition, and then to preserve its activity from change, so that its quantities may be uniform; and this is pharmacy.

Modern investigation and experience have shown that the principal and prominent effect of the administration of ergot to human beings, in adequate quantity, is to cause contraction of the involuntary or unstriated muscular fibre wherever this is found. The gravid uterus being constituted principally of this variety of muscular tissue, this was the organ upon which its effects were first observed; and it was long used as a parturient, both by empirics and by the medical profession, before its more general effects were recognized. One of the most important deposits of unstriated muscular fibre is that which constitutes the middle coat of the arteries; and any agent which causes contraction in this, diminishes the quantity

of blood which passes through the vessels, and so modifies the nutrition of diseased parts. Hence the uses of ergot in cerebral and spinal congestions, in capillary hæmorrhages, in bloody tumours, and especially in tumours and hæmorrhagic affections of the uterus, such as fibroids, polypi, etc. As a parturient, a single dose or two is sufficient, and it matters little in what form or how that is given, if the quality be assured and the quantity sufficient. But for many of the other uses it requires to be taken for weeks or months in full and frequent doses, as the only means of keeping up its effects until the cure is established, and hence the prime necessity for a stable and uniform preparation of the drug.

The first requisite to any trustworthy preparation of ergot is, of course, a uniform good quality in the drug, and this is by no means easy to attain. The American market is now overstocked with ergot at extremely low prices. Tons of it may be had at sixteen to eighteen cents per pound, but it is all so small as to render it almost certain that it is from oats, barley, or wheat, rather than from rye; while its deficiency in odour and taste, and its uncleanness, forbid the idea of its being trustworthy. Most of it is imported in bags, and thus only by chance can arrive in proper condition. Much of it is contaminated with the seeds of various weeds, and requires much labour in cleaning, as the weed-seeds are often very bitter, and may be poisonous. It is not unfrequently wormy, or bears the marks of having been cleaned from worms and worm-dust to improve the chances of sales and profits. Occasional lots, and these often large, lots, look as if they had been washed, and suggest the idea of having been partially exhausted for the making of some of the so-called "ergotins." Hence it may be easily understood that to obtain a uniform supply of good ergot is a very difficult matter, even with the screw of price entirely taken off. Throughout the present crop the writer has paid various prices, from 1.25 dollars down to 22 cents, without always being able to get what was desired, though always on the alert in a large market, and always in the presence of far lower prices. Many good authorities state that wheat and oat ergot is as good as that from rye, and some even give the preference to that from wheat; but after many years of pretty close observation, the writer has failed to convince himself that these cheaper varieties are as good. They are certainly very inferior in odour and taste, and it is not an unfair inference, nor without natural analogy, that it finds better conditions for growth in its original and more natural habitat in the paleæ of the rye, where it certainly grows most vigorously.

The existence of one or more active principles in ergot, which may be isolated for therapeutic use, has been very generally believed; and various substances have been extracted and sold under the name of ergotin; those of different makers having different properties and different doses, but all producing some of the effects of ergot, though in very different degrees. After a careful attention to the literature of this subject, and comparing it with the results which seem to have been realized in practice by experience, the writer does not believe that there is an active principle separable from ergot which, in any proper sense, represents the drug. Like senna, rhubarb, and many other drugs, its effects seem to be dependent upon a natural association of its various separable elements. If this be true, there is no such thing as ergotin, and the various substances so called only represent the activity of the drug as they represent more or less perfectly its entire composition. Of course certain of its constituents, such as lignin, starch, fixed oil, gum, etc., are known to be inert; and such being excluded by the choice of a proper menstruum for extracting it, the nearer its preparations come to representing or containing all the remainder of the drug the better. The molecular constitution of the active portion of the drug seems, however, in its natural condition, to be loose, and like a slow fermentation, to be undergoing slow molecular changes, so that by age its peculiar activity is slowly diminished until finally lost. This process of change seems to be arrested by acids, just as many other delicate slow changes are; and whether this be effected by the substitution of a more permanent acid for a less permanent one, in one or more salts, as has been suggested by Professor Proctor, but not distinctly proved, or how it is effected, seems as yet unknown. It is, however, well established that the addition of about 1 per cent. of acetic acid, which is added to the officinal fluid extract of 1860, renders this liquid preparation permanent; at least the writer has known the same preparation to be continuously used as a parturient for six years, without apparent change in activity, though watched closely for such change throughout the time, until the parcel on trial was all used. The ergot in the grain, however well kept, is known to become inactive without known change in appearance, though the sensible properties, such as the odour and taste, may, and probably do, change. Ergot in powder is known to diminish in activity much more rapidly than when in grain, and probably soon becomes inert. The tincture and wine of ergot are believed to change, though more slowly than the ergot, in substance; whilst the extracts and so-called "ergotins" are all supposed to change more

rapidly than the tincture. Much of this latter, however, is traditional rather than exact knowledge, and must be presented as such.

There can probably be no better preparation of ergot than the official fluid extract of the U. S. Pharmacopœia of 1860.* The formula for this was published by Professor Proctor in the Proceedings of this Association in 1852, and the writer has made it continuously by this formula ever since. From this experience in making, which now amounts to many thousands of pounds, and from frequent opportunities of hearing of its activity and its effects, as well as of its permanency, the above statement of its value is made up. When given in frequent large doses for a long time, however, as is required for many of the more modern uses of the drug, it becomes very disagreeable, and occasionally deranges the stomach, producing nausea, loss of appetite, and consequent debility. Occasional intermissions in its use, with other suggestions of care and skill, will often relieve the stomach for a time without material intermission in the effects. It has also been often and much used by hypodermic injection, generally through the integument of the abdomen, in order to relieve the stomach, and it generally acts promptly and energetically when thus used, though in smaller dose; but from being loaded with organic matter, and containing alcohol and a little free acetic acid, it is very apt to produce small abscesses, and thus cause much suffering. Indeed it is by no means well adapted to hypodermic use, and such use of it has always been discouraged by the writer.

Fluid extract of ergot has also been used as a topical application to the os uteri upon cotton-wool, but is inappropriate to such uses on account of the irritant action of the alcohol. Physicians who observe closely, and who by looking for effects get rid of the trammel of arbitrary doses, appear to be most successful in the uses of ergot; and such physicians often, if not generally, use this preparation in

* In the last revision of the U. S. Pharmacopœia the formula and process for this fluid extract have been materially changed; first, by the introduction of glycerin, and next by adding the acetic acid to the preparation after the percolation, instead of percolating the drug with an acidulated menstruum. It is difficult to account for these changes in a preparation so well established and so well tried without known complaint. The addition of glycerin may have been to bring it into uniformity with other fluid extracts—a uniformity of very doubtful utility at best—but the change in the use of the acetic acid seems still more objectionable. The present official fluid extract will not serve to make the solid extract from.

much larger quantity than the doses given in the older books. It is most frequently used in females, and for affections of the uterus, and here an excellent indication of its maximum useful effects is easily reached in most cases by the production of uterine colic. In the treatment of fibroids, polypi, etc., it is perhaps the best practice to begin with the standard dose, and increase this until uterine colic occurs, and then diminish the dose so as to come just short of this in the succeeding continuous administration. The dangers of ergotism or ergot poisoning seem to have been overrated, since the writer has diligently inquired for such results from those who use it most largely, but has heard of no instance of hurtful effect. Dr. A. Jacobi, of New York, who has probably used it as frequently and in as large quantities or doses as any one in America, with both adults and children, and who is a competent authority, and a close observer, recently replied that he had never seen an instance of ergot poisoning, nor heard of one in the practice of his associates. Notwithstanding this, he and all careful practitioners are always most careful and most watchful in this respect, and probably their exemption from bad effects depends upon their seeing indications of danger before they reach the point of danger. Besides, it is probable that the ergot poisoning described as the result of eating ergotized food, etc., could only occur among an underfed, semi-scorbutic people; or under other conditions not present in cases ordinarily requiring medication by ergot. Dr. W. C. Wey, of Elmira, who has also used ergot freely, had at least one case in which it had been used in the treatment of a fibroid tumour of the uterus, with occasional interruptions, by the stomach, hypodermically and topically, during a period of more than two years, not only without poisoning, but with great advantage.

In January of 1869, Professor Langenbeck, of Berlin, first used what is loosely described as an "aqueous solution of secale" by hypodermic injection, in the treatment of aneurisms, with marked advantage. This practice is described in the Berlin *Klinik Wochenschrift*, and an epitome of the paper is published in "Ranking's Abstract" for July, for 1870, p. 223. In the same Berlin journal for 1872, Dr. Hildebrandt published the results of hypodermic injections of ergotin in the treatment of uterine fibroid tumours. This paper is epitomized in "Ranking's Abstract" for January, 1873, p. 248. This treatment when tried in this country seemed to be difficult and uncertain, for want of a trustworthy and uniform preparation which should fairly represent ergot, and be adapted to hypodermic use, and at the request of Drs. J. Marion Sims, of New

York, and W. C. Wey, of Elmira, the writer undertook what seemed to be a hopeless task, of making a preparation well-adapted to hypodermic use.

Disbelieving in the existence of any separable active principle in ergot at all analogous to the morphia of opium, no preparation seemed available except an extract which should be soluble in an aqueous menstruum. Then knowing the difficulty with which non-diffusible extractive matters are absorbed when deposited in the subcutaneous cellular tissue, and the liability of such matters, however bland, to cause troublesome abscesses, the problem seemed to be impracticable. After a good deal of time and trouble given to the matter, and many complicated trials, which need not be detailed, the best practical result reached was that of making a solid extract of ergot by the evaporation of the fluid extract of the U. S. Pharmacopœia of 1860, at a very low temperature, by mechanical stirring.

If this fluid extract, carefully made by repercolation from good rye ergot, without any heat, be evaporated in a shallow capsule in a bath of water of $50^{\circ}\text{C.} = 122^{\circ}\text{F.}$, by active and continuous stirring, until it is reduced to one-sixth of the weight of the original fluid extract taken, the result will be a spongy extract of a light brown colour, full of air incorporated by the mechanical agitation, and looking a little like pulled molasses candy. This extract has the full odour and taste of the fluid extract, concentrated by condensation, and probably has the full therapeutic value of the ergot from which it is made; and each grain of it represents six minims of the fluid extract, or six grains of the ergot from which the fluid extract was made. It is quite insoluble in cold stronger alcohol, but entirely soluble in diluted alcohol, and is also easily soluble in water, with the exception of an insignificant residue which is easily filtered out. Its solutions are slightly acid to litmus paper, and have their ergot odour strongly increased by the addition of alkalies. The concentrated solution in water is turbid before filtration, but after filtration is of a deep rich garnet-brown colour. How this extract or its solutions will keep is of course unknown, but the probabilities of keeping unchanged are quite favourable in regard to the extract, but unfavourable for the aqueous solution. A five-grain pill of this extract of course represents the mean dose of thirty minims of fluid extract, or thirty grains of ergot, and it is not only much more easily taken, but in delicate conditions of stomach is much less liable to produce nausea, loss of appetite, etc. It does not, however, always agree better with sensitive stomachs than the fluid extract, nor does the stomach always tolerate it much longer. Hence it is

very desirable often to relieve the stomach altogether for a longer time than the brief intermissions that can be permitted without losing ground already gained by the treatment; and to effect this, hypodermic and topical administration may be resorted to. Hypodermic medication is merely a short cut into the circulation whereby the process of digestion and assimilation, and the organs by which this process is effected, are avoided, the absorption taking place directly from the cellular tissue. Hence the therapeutic action is more prompt; and in the case of medicines which are liable to decomposition in the process of digestion, or to loss by entanglement with the fecal matters, smaller quantities are required to produce a given effect. But then, as most medicines are irritant, or at best liable to act as foreign bodies when introduced under the skin, they will more or less frequently cause abscess and painful irritation, and this in proportion to quantity, irritant nature, and their being more or less loaded with matters which are not diffusible. The filtered aqueous solution of this extract of ergot, though not well adapted to hypodermic use, is better adapted to it than the fluid extract, and perhaps is as well adapted as any preparation of the drug can be under the supposed required conditions. Such a solution has been used in this way with variable success. In some hands it seems to have been moderately successful, in others less so, while in some it has produced abscess so often that it was soon abandoned. The solution may be made of almost any desired strength, but that which seems to have answered best is the same as the fluid extract, or a minim for each grain of ergot represented in the extract. To make this solution, sixty grains of the extract is weighed into a small vessel, and dissolved in about four fluid drachms of water by stirring. It is then poured into a small wet filter, supported over a vial marked for containing just six fluid drachms, and when the liquid has passed through, the filter is rinsed through with water until the measure of six fluid drachms is reached. This solution should be made every week or two, or in summer more frequently, until its permanence be ascertained. If desired, it may easily be made of double the above strength by halving the proportion of water, but what is thus gained in the quantity of the injection is perhaps overbalanced by the disadvantages of density in retarding the absorption.

The same solution seems well adapted to use as a topical application; the desired dose being put upon a dossil of cotton-wool, and this applied to the os uteri, with another dossil behind it. It might be inferred that this would be a very imperfect method of administra-

tion, and when first proposed by Dr. Wey as an alternative method, the writer predicted its failure, not being then aware of a somewhat similar practice in Germany as long ago as 1836. Dr. Wey, however, succeeded well, and produced the characteristic uterine colic within two hours or less. This topical method may also be used by means of suppositories, and the best vehicle for the extract seems to be the mixture of gelatin water and glycerin, which, when in proper proportions, make a very firm jelly, that does not become hard, and keeps indefinitely. Besides, it melts at a gentle heat, and is readily soluble in aqueous liquids. This is but a nicer and more simple form of the compound used for the inking rollers of printers. It seems not improbable that oleic acid might be used as a vehicle for this extract, thus adapting it to dermic administration; but as yet no trials have been made.

Note on *Liatris Odoratissima*. John R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, iv., 322.) Under the name of wild vanilla, the leaves of *Liatris odoratissima*, Willd., are sometimes used in North America as a substitute for true vanilla. The plant belongs to the Compositæ, and grows to the height of three or four feet, with an erect annual stem, terminated by a corymb of beautiful purple flowers; the odour of the leaves is very perceptible when bruised, and this odour has been referred to the presence of the principle coumarin. It is said that many of the flavouring fruit essences, perfumes, etc., are produced in America from the leaves of this plant, and they have also been occasionally employed to give a pleasant fragrance to tobacco and cigars. This application has been largely extended of late, and the leaves are brought to market in small bales. They are mostly selected from the lower part of the plant, and are about six inches long by three broad. The smaller and less perfect leaves are used for fillers of cigars, while the large and sound ones are used for wrappers.

The plant is said to be very abundant in Florida, and it has been suggested that if it were submitted to cultivation, and the stalk cut back, so as to induce the development of large leaves, it might be improved in quality and value. The flavour that these leaves impart to tobacco is approved of by many persons, and it has the advantage of having no deleterious properties. Another use to which the leaves are put is for the purpose of protecting woollen cloths from the attacks of moths. Other species of *Liatris*, such as *L. scariosa*, *L. squarrosa*, and *L. spicata* are considered to have medicinal properties; the former is employed in making a gargle for sore throats, also in gonorrhœa, and it has a reputation for the cure of

snake bites. The root of *L. squarrosa* is acrid and pungent, and yields a balsamic substance to alcohol. *L. spicata* is called button snake-root, and has some reputation as a stimulant, diuretic, and expectorant. It is used in the form of a tincture or decoction made from the root.

On the Yellow Colour of the Bark of *Prinos Verticillata*.
W. I. Leech. (*Amer. Journ. Pharm.*, vol. iii., No. vi., 251.)

The following is a summary of the author's experiments, undertaken with the view of ascertaining whether the yellow colour of the bark is due to berberina, the probability of which had been suggested by Professor Maisch.

A decoction was made by boiling sixteen troy ounces of the coarsely powdered bark, repeatedly with water; on mixing the solutions and filtering, a dark yellow-coloured liquid was obtained, with a strong odour and taste of the drug, and very prone to froth. This decoction was evaporated to the consistence of an extract, and this digested in hot alcohol in the proportion of half a pint to the pound of bark, and again filtered. The filtered liquid was mixed with one fourth of its bulk of water, most of the alcohol recovered by distillation, the remaining liquid, while still hot, mixed with sulphuric acid in slight excess, and set aside for several days. The expected formation of crystals of sulphate of berberina did not take place.

The author then repeated the above experiment twice, using muriatic and nitric acid successively, but again with a negative result.

He next exhausted a portion of the bark by boiling it repeatedly with hydrate of calcium and water, mixed the filtered decoctions, evaporated to the consistence of an extract, treated this with alcohol, filtered, evaporated the alcoholic solution, and treated the residue with boiling water; on cooling he failed to get any crystals. Nor did he succeed by the subsequent addition of sulphuric acid.

Another portion of the bark was exhausted with alcohol, most of the alcohol was distilled off, the residue evaporated to dryness, treated with boiling water, filtered, hydrochloric acid added in slight excess, and set aside as before, but again no crystals were formed.

The above experiments were all repeated several times with similar results. The bark used was a very fine article, collected late in the fall, and of the fourth year's growth.

The Pituri: a New Narcotic. (From the *London Medical Record*.) Dr. G. Bennett, writing to the *New South Wales Medical Gazette*, vol. iii., No. viii., May, 1873, some notes on Queensland, says

that Mr. Hill gave him a preparation obtained from the leaves of a plant named by the aborigines of the interior "pituri." It was obtained by Mr. James Gilmour, when in search of Dr. Leichhardt, from the natives, in the form of dried leaves; and was used by them as a stimulating narcotic, in a similar manner to the betel of the East, and forming a substitute for tobacco. It was erroneously labelled on the bottle containing the preparation, "Pituri Oil;" for, on examination, it was found to be spirituous, as if the leaves had fermented in the act of distillation. The botanical character of the plant could not be ascertained, from the leaves being dried, and in so pulverized a state that a perfect leaf could not be found. Mr. Hill stated that he had found that the effects of a teaspoonful of this liquid in a glass of water was to produce a burning sensation in the stomach, followed by vomiting and giddiness.

The following is an abstract of a paper read before the Queensland Philosophical Society, March, 1872, on the pituri, by Dr. Bancroft:—

"On February 9th of this year I obtained from Mr. Gilmour a quantity of dried leaves, and the particulars here narrated, of a plant used by the natives as a stimulating narcotic. These leaves, called 'pituri,' were obtained in the neighbourhood of the water-hole Kulloo, eight miles beyond Eyre's Creek.

"The use of the pituri is confined to the men of a tribe called Mallutha, all the males of which tribe are circumcised.

"The pituri is carried in neatly made oval pointed bags, specimens of which Mr. Gilmour has brought.

"The old men, before any serious undertaking, chew these dried leaves, appearing to use about a teaspoonful. A few twigs are burnt, and the ashes mixed therewith. After a slight mastication, the bolus is placed behind the ear, to be again chewed from time to time, the whole of which is at last swallowed. The native after this is in a sufficiently courageous state of mind to fight or undertake any serious business.

"One old man, with whom Mr. Gilmour and party fell in, refused to have anything to say or do until he had chewed the pituri; after which he rose and harangued in grand style, ordering the explorers to leave the place. The pituri caused a severe headache in persons who tried it. The dust given off in examining the leaves causes sneezing."

The above is the information supplied by Mr. Gilmour. Mr. Wills' diary from Cooper's Creek homeward (p. 213), has the following:—

"May 7, 1861.—In the evening various members of the tribe came down with lumps of nardoo and handfuls of fish, until we were positively unable to eat any more. They also gave us some stuff they call bedgery or pedgery; it has a highly intoxicating effect when chewed even in small quantities. It appears to be the dried stems and leaves of some shrub.

"The pituri consists of leaves broken into small particles, and mixed with acacia leaves, small dried berries containing reniform seeds, and unexpanded flower-buds of the shape of a minute caper."

After describing in detail some experiments he made with an infusion of the pituri, Dr. Bancroft thus enumerates its effects:—

"1. Period of preliminary excitement from apparent loss of inhibitory power of the cerebrum, attended with rapid respiration; in cats and dogs, with vomiting, and profuse secretion of saliva.

"2. Irregular muscular action, followed by general convulsion.

"3. Paralysis of respiratory function of medulla.

"4. Death, or

"5. Sighing inspirations at long intervals.

"6. Rapid respiration and returning consciousness.

"7. Normal respiration and general torpidity, not unattended with danger to life."

The poison given by the mouth acts with less vigour; when it is injected into the intestines the results are more certain. The animal has a longer stage of excitement, the convulsive fit is not so severe, and recovery is more certain. Torpidity remains for some hours.

A quarter of a drop injected under the skin of a rat causes excitement; the animal starts with slight noises, may fall over a few times from very strong muscular irregularities, remains excitable for some time, then gradually becomes torpid.

In small medical doses we may expect to find the period of the excitement and the torpidity to be the only marked symptoms. In cats and dogs the excitement is not marked, but vomiting of a violent kind occurs.

Some leaves of a tree of the natural order Lauraceæ, and of the genus *Tetranthera*, used medicinally by the aborigines of New South Wales, were given to Dr. Bennett, which had been brought from the Bogan and Darling, where they are smoked by the aborigines for pains in the head and other ailments. It is called by them yarran. The leaves have also been smoked by Europeans, and found beneficial in cases of asthma. The tree grows from twelve to fifteen feet high; the wood is hard, and used by the aborigines for clubs.

The editor of the *New South Wales Medical Gazette* adds that at the Cape of Good Hope there is a Composite plant, the *Parchonanthus camphoratus*, Linn., the leaves of which, when dried, are smoked by the Hottentots and Bushmen instead of tobacco, exhibiting slight narcotic effects. In the form of infusion they promote perspiration, and are said to be useful in spasmodic asthma. The wild dagga (*Leonotus leonurus*, R. Brown), which bears very beautiful flowers, and belongs to the order Labiatae, is abundant at the Cape, and is also smoked by the Hottentots instead of tobacco, with similar narcotic symptoms to the preceding.

The Oleo-Resin of Helianthus Annuus. M. Chardon. (*Repert. de Pharm.*, i., 537.) An oleo-resin, similar to the turpentine of coniferous trees, was observed by the author to exude from the flower of *Helianthus annuus* (the sunflower) in Algeria. As soon as the capitula became uncovered by the opening of the foliaceous involucre, transparent and colourless drops appeared on the margins of the projecting bractlets; and they were the more numerous the more vigorously the stem had grown.

The odour of the semi-liquid substance thus obtained, much resembled that of the oleo-resin of *Pinus maritima*; its taste was burning and aromatic, but not sweet. When heated it gave off a volatile oil, leaving a brittle resin, similar to colophony. It was perfectly soluble in alcohol. Exposed to the air in thin layers it became dry, and lost its adhesiveness.

Whether this substance is of general occurrence in the sunflower, or whether it is peculiar to the helianthus of Algeria, remains still undecided.

Benzoin Odoriferum, Nees. J. Morris Jones. (*Amer. Journ. Pharm.*, 1873, 300.) The common names of this indigenous shrub are spice-wood, spice-bush, fever-wood, fever-bush, Benjamin-bush, wild allspice, soap-wood, spice-berry.

The small branches are used as an aromatic stimulant tonic in the forms of infusion, tincture, and fluid extract. The proportions of the drug in these preparations are—infusion, two ounces to the pint of boiling water; tincture, two ounces per pint of proof spirit; the fluid extract contains one ounce in one fluid ounce. It is used as an agreeable drink in low fevers and in intermittents, and also as a vermifuge.

The oil of the berries is used as a stimulant. The infusion has an aromatic and astringent taste and the odour of the bark; the tincture is brownish red, and has the same taste and odour as the infusion.

The author's analysis of the bark proves the presence of the following constituents: tannin, resin, wax, starch, sugar, chlorophyll, albumen, and a volatile oil which belongs to the cinnamyl series, as the addition of permanganate of potash, or of bichromate of potash and sulphuric acid, produces the odour of bitter almonds.

The Identity of Scammonine prepared from the Root of *Convolvulus Scammonia*, with that obtained from Aleppo Scammony. Prof. Spirgatis. (*Repertor. der Pharm.*, xxiii, 260.)

As some of the modern pharmacopœias require the resin of scammony to be prepared from scammony root, and not from the gum resin, from which it was formerly made, the author wished to ascertain whether, as some have maintained, there is any appreciable difference between samples of scammonine (the purest form of scammony resin) obtained from the two sources. He prepared scammonine by exhausting the roots, first with water and then with alcohol, decolourizing the alcoholic liquids by charcoal, removing the spirit by distillation and long continued washing of the separated resin with hot water. The preparation thus obtained was carefully compared with a sample of scammonine made from Aleppo scammony on a previous occasion (the author's researches on scammonine from the gum-resin will be found in the *Annalen der Chem. und Pharm.*, 116, 289). Both were amorphous, colourless, transparent, odourless, exhibiting the same phenomena when ignited, and showing precisely the same behaviour to solvents, such as alcohol, ether, chloroform, oil of turpentine, acetic acid, sulphuric acid, alkalies, and their carbonates. Nor did their alcoholic solutions exhibit any difference whatever when acted upon by acetate of copper, acetate or subacetate of lead, nitrate of silver, or perchloride of iron. Knuyse maintains that there is a difference in the degree of solubility of the two substances in ether chloroform, ammonia, and turpentine, and that one is almost insoluble in ammonia, and the other totally insoluble in turpentine; a statement which the author shows to be quite incorrect, even in reference to the impure resins with which Knuyse operated, for even those will leave nothing but their impurities undissolved when treated with the solvents named. The pure colourless resins when produced are completely soluble even in cold oil of turpentine. The statement, still met with in books on materia medica, that an adulteration of resin of scammony with common resin can be detected by the solubility of the latter in turpentine must therefore be dismissed as erroneous.

Three analyses of the scammonine from the root gave the following results:—

	1.	2.	3.
C	56.62	56.59	56.62
H	7.75	7.70	7.88
O	—	—	—

The scammonine from the Aleppo gum-resin was also again examined, with the same results as were obtained in the author's previous researches on this substance, viz. :—

C	56.60
H	7.76
O	—

The identity of the two resins would thus appear to be fully established.

African Tea Plants. J. R. Jackson. (*Pharm. Journ.*, 3rd series, iv., 421.) It is interesting to note the numerous British plants that are used by the peasantry in rural districts in this country for the purpose of making an infusion which is commonly called tea, and which is often given for the cure of various disorders of the human system. A more extended interest is attached to the numerous plants which are used in different countries for a similar purpose, as well as for a refreshing beverage which is drunk as we drink the Chinese article. Thus we have Labrador tea, the leaves of *Ledum latifolium*; Faham or orchid tea of Madagascar (*Angræcum fragrans*), and, above all, Paragnay tea, the leaves of *Ilex Paraguayensis*, which occupies as important a position in South America as the leaves of *Thea Chinensis* do with us. Its use is said to have been derived from the aborigines, and has been continued for a long period of time. It is estimated that the quantity consumed in the country comes to nearly or quite 8,000,000 lbs. annually. The mode of preparing the leaves for use differs from that adopted by the Chinese, inasmuch as the leaves are not gathered separately, but whole branches or twigs are cut off and placed on hurdles over a fire until properly dried or roasted, when each branch is beaten, and the leaves which are thus removed are reduced to a powder. To drink this tea, an infusion is made in a small pot formed of a gourd, and the fluid is drawn into the mouth through a small tube.

The names tea-plant and tea-tree are sometimes applied to large timber trees, as in the case of the Australian tea-trees, species of *Leptospermum* and *Melaleuca*. It is, however, of some of the African tea plants that we have now more especially to speak, *Cyclopia*, *Borbonia*, *Cliffortia*, and *Catha* are genera whose species

are known in certain localities as tea plants. The first two belong to the Leguminosæ. *Cyclopia* consists of nine species, mostly shrubs or bushes, natives of South Africa. The leaves are alternate, sessile and trifoliate, the leaflets linear, smooth or pubescent, their margins frequently revolute. The flowers are yellow, papilionaceous, stalked and bracteate, and are mostly borne in the axils of the upper leaves. Round the pedicel at the base of the calyx is a circular depression, a character by which the species may be recognized from their allies. The fruits are compressed oblong pods, bearing numerous seeds.

C. genistoides, Vent., is known at the Cape as bush tea, the leaflets being used for that purpose. It has a strong aroma resembling Chinese tea, and a sweetish astringent taste. It is used in medicine for assisting expectoration in chronic catarrh, and also in consumption. Though the present species is that generally spoken of as yielding bush tea, the leaflets of other species no doubt are used for a similar purpose,—*C. Vogelii*, Harv., undoubtedly being one of them. Another South African leguminous genus, the leaflets of which are used for making a medicinal infusion, known to the colonists as "Stekel-thee," is *Borbonia*; the genus consists of thirteen species all natives of South Africa. They are shrubs with compressed, angular, winged branches, and alternate, many-nerved leaves. The flowers are papilionaceous, yellow, and are borne in terminal or axillary racemes. The pods are linear, somewhat flattened, and are mostly covered with long soft hairs. *B. parviflora*, Lam., is the species mostly used, the leaves of which are given as a diuretic in the form of decoction.

Cliffortia is a genus of Rosaceæ, and is composed of about forty species. They are bushes, all natives of South Africa. They have small alternate leaves, composed of two or three leaflets; in the species in which the three leaflets occur, the two side ones are small, and united more or less to the centre one, thus giving the leaf the appearance of being a simple, instead of a compound one. The flowers are small, dicecious, and produced in the axils of the leaves. Both the male and female flowers have the calyx tube contracted at the top, the former containing about thirty stamens, and the latter with one or two achenes, each surmounted with a bearded or feathery style. *C. ilicifolia*, L., is the species the leaves of which are used at the Cape under the name of Doorn-thee as an emollient and expectorant in coughs.

The leaves of two or three species of *Helichrysum*—a well-known genus of Compositæ—are used at the Cape under the several names

of Caffre tea, Hottentot's tea, and Duinen-thee. The first-named is procured from *Helichrysum nudiflorum*, Less., a common herbaceous plant of the colony, with stalked, amplexicaul, ovato-lanceolate radical leaves, and narrow, lanceolate, sharp-pointed cauline leaves. The flowerheads are terminal, corymbose, and the flowers yellow. The plant is demulcent, and an infusion made from it is recommended in phthisis, catarrh, and pulmonary complaints generally. *H. serpyllifolium*, Less., furnishes Hottentot's tea. It has an agreeable smell, and is a favourite amongst the natives. It is said to possess demulcent and emollient properties, and is used for similar purposes to the last-named species. The leaves of *H. imbricatum*, Less., constitute the Duinen-thee—literally tea from the Downs, in reference to the plant being common on the Cape Downs. This is likewise used in coughs and chest diseases, as are also the leaves of *H. auriculatum*, Less.

Methyscophyllum glaucum, E. and Z., an amyridaceous shrub, with opposite, lanceolate, glabrous leaves, recurved at the margins, and flowers borne in axillary panicles, furnishes what is known as Boschjesmans-thee; from the leaves is made an infusion which has a very pleasant flavour, and besides being used for coughs, asthmatic and similar diseases, is a favourite drink with the Bushmen and others.

Catha edulis, Forsk., a celastrineous shrub, the leaves of which are largely used as tea in Arabia, under the name of Kât, is so far as its African habitat goes, confined to the eastern part of the continent. In Arabia the twigs, with the young leaves remaining, are very extensively collected, and form an important article of trade among the Arabs, large quantities being annually brought to Aden from the interior. The twigs are made up into bundles, varying in size according to quality. The use of this tea is said to produce effects somewhat similar to those produced by the Peruvian coca (*Erythroxylon Coca*), namely, extreme wakefulness and capability of bearing extra strain with a minimum of fatigue. Taken in decoction, in moderate quantity, its effect is exhilarating, nearly analogous to that of Chinese green tea.

Karakin. W. Skey. (*Neues Jahrbuch der Pharmacie*, xxxix., 6, 338.)

The author has isolated the bitter poisonous constituent of the kernel of the karaka berry, which is derived from a tree indigenous to New Zealand. The kernels were crushed, and exhausted with successive portions of cold water, until the residue of meal had lost all the bitter taste. The liquor thus obtained was slightly acidified with a small portion of acetic acid, to remove casein and emulsin,

filtered, and the filtrate shaken with animal charcoal, until the bitter taste had disappeared. The charcoal was then exhausted with boiling alcohol, and this liquor left to stand for two or three days in a cool place. At the end of this time beautiful crystals, grouped in rays, formed from the solution.

The substance thus separated, called by the author "karakin," tastes very bitter, has a white pearly lustre, gives a slight acid reaction with litmus, and melts at 100°C . Hot sulphuric acid produces with it a dark rose-red colour. It dissolves but slightly in cold water, but rather freely in boiling water, and in alcohol, hydrochloric acid, acetic acid, ammonia, and caustic potash; it is altogether insoluble in ether and chloroform.

Karakin contains no nitrogen, and gives no precipitate with tannic acid or with iodohydrargyrate of potassium, thus it is no alkaloid. Alkaline solution of copper sulphate throws down a green precipitate, in which reaction it resembles digitaline. The precipitates of both differ however in this, that the digitaline precipitate undergoes no change when heated to about 100°C ., whereas the karakin precipitate reduces the salt to suboxide. If, however, digitaline be treated with an acid, previous to being tested with an alkaline solution of sulphate of copper, the resulting precipitate will reduce the copper salt when heated to about 150°C .

The Constituents of Cubebs. C. F. Schulze. (*Pharm. Centralhalle*, 1873, No. 29, 242.) The author exhausted 250 grammes of coarsely powdered cubebs repeatedly with ether (0.728) until the latter passed colourless through the percolator. The united ethereal tinctures were distilled to recover the ether, the residue heated with solution of caustic soda (1.08 sp. gr.) on a water-bath, and set aside to cool. After some time a layer of soap formed on the surface, and numerous crystals were observed in the liquid underneath. On boiling the soapy layer again with solution of soda, some more of the crystals were obtained after cooling. After separating the crystals from the liquors, the latter were united and strongly concentrated by evaporation in order to obtain still more of the crystals. The soap was now dissolved in water, the solution mixed with an equal volume of alcohol of 90 per cent., and set aside for several days, when an oily layer was observed on the surface, and a small quantity of crystals at the bottom of the vessel. These crystals were found to be cubebene; they left no alkaline residue after ignition, which the first named crystals did, even after repeated recrystallization from alcohol, and they also differed from those in size and shape.

The author then exhausted a larger quantity of cubebs (750

grammes) with alcohol of 0.83 sp. gr. instead of ether, distilled off the spirit, treated the residue with solution of caustic soda, and proceeded in the same manner as before. The crystals formed were recrystallized from alcohol of 90 per cent., and thus obtained as fine white needles. As already stated, they left on ignition an alkaline residue, effervescing with acids. They had a bitter taste, and became discoloured on exposure to air. Sulphuric acid imparted to them a crimson colour which disappeared on the addition of a large quantity of water.

In order to ascertain the chemical formula of the acid of this sodium salt, which the author calls cubebate of sodium; this salt was decomposed by sulphuric acid, the resinous substance which separated dissolved in alcohol, solution of subacetate of lead added, the lead removed by sulphuretted hydrogen, and filtered. The filtrate, when evaporated on a water-bath, left the cubebic acid as a pale yellowish resinous body, which the author vainly endeavoured to obtain in a crystalline state from its solutions in chloroform, bisulphide of carbon, benzine, and petroleum ether. It was always obtained as an amorphous mass, which soon turned dark on exposure to the air. It forms amorphous precipitates with the alkaline earth and metallic oxides. It fuses at 45° C., and cannot be sublimed, but turns black upon heating, and then burns with a smoky flame. Its reaction with sulphuric acid has already been described. The analysis of the acid led to the formula $\text{H O, C}_{28} \text{H}_{15} \text{O}_7$.

Neutral Resin.—The residue of the soap, after removing the oil and cubebine, was treated with hydrochloric acid, when a brown resin separated, which could not by any means be obtained in a crystalline form. It was of a pilular consistence, very soluble in ether and chloroform, but only sparingly so in alkaline solutions. Sulphuric acid forms with it a brown mixture, which, upon the addition of nitric acid, acquires a purplish red colour, changing to violet, and finally to brown.

Cubebine.—The soap-cake resulting from the preparation of cubebate of sodium was dissolved in a small quantity of water, the solution mixed with an equal bulk of rectified spirit, and the mixture allowed to cool, when both fatty oil and cubebine separated. Upon recrystallizing the latter from a solution in hot rectified spirit, it was obtained in white silky filiform crystals resembling disulphate of quinine. They were tasteless, insoluble in water, sparingly soluble in cold, but readily soluble in hot, alcohol. Caustic potash would not dissolve them, and their solution in boiling hydrochloric acid became turbid upon cooling. A few of these crystals

placed in strong sulphuric acid developed a purplish red colour, which changed into brown on the addition of nitric acid, and became colourless on the addition of potassium permanganate. Cubebine cannot be sublimed, but turns black on heating, and burns with a smoky flame. Its melting point is 115° C. Its characters and tests show it to be identical with the cubebine discovered by Capitaine and Soubeiran.

As the crystals of cubebate of sodium obtained as above have a slight taste and smell of the volatile oil of cubebs, the author recommends this sodium salt and the cubebic acid to be made from the residue left on the distillation of the oil.

The Collection of Gum Senegal in Senegambia. Dr. Beranger Feraud. (*Pharm. Journ.*, 3rd series, iv., 166; from *L'Union Pharmac. (Bulletin)*, i., 67.)

Since the discovery of Senegambia, the gum of the country has been one of the principal objects of exchange between Europeans and the indigenous blacks, and the traffic has been so extensive and important that even the policy of the country has sometimes been subordinated to it. Senegal gum is yielded by several trees of the same genus (*Acacia Arabica*, *A. Seyal*, *A. Verek*, *A. Adansonii*), and it cannot be pretended that all the species are yet known. These gum trees, which grow in the Sahara regions, are cultivated by the Moors and some black tribes, who carry the product to the various markets scattered along the banks of the Senegal. The trees also grow spontaneously in many parts of Senegambia, especially on the right bank of the Senegal. It is there that the forests of gum trees occur, if such a term can be applied to the very thinly sown agglomerations of these trees.

The forests of gum trees from which the products are sent into Senegambia are three in number:—(1) that of Alfatak, or Afatac, which is situated about fifteen leagues from the river, opposite Podor, and extends to Lake Cayar, occupying a large portion of the country of the Brakna; (2) that of Liebar, or El Ebkar ("the wells"), situated thirty or forty leagues from the river, in the country of the Darmancour Moors, and containing many small red gum trees (*A. nilotica*); (3) that of Sahel, in the territory of the Tatarza Moors, the product of which is carried to Gahé. The latter forest consists exclusively of white gum trees, and it is the gum from these trees which is carried to Portendick to supply the demands of English traders.

The following details are given on the authority of M. Carrière. A gum forest is looked upon as a sacred place, where no stranger

dares break off a branch or carry away the gum, under pain of celestial in addition to terrestrial punishments. Each of the members of a tribe which possesses a gum forest has the right to collect gum in it, and his share depends upon his activity, he having a right to that only which is collected by himself or by his slaves. The first collection of gum commences in October, at which time those of the tribe who intend collecting the gum establish themselves in huts on the outskirts of the forest, and within reach of the wells. The collection of gum is very laborious, for the forest abounds in climbing and prickly plants, so that the trees are not gained without infinite trouble and numerous punctures and excoriations; but the appetite for gain overcomes all obstacles. The master is stimulated by the wants of his family and by pride, the slave is driven by hunger and the fear of beatings; thus all labour with sustained ardour, and little by little the gum is collected.

For the removal of the gum from the branches of the acacia whence it exudes, the Moors arm themselves with long sticks crooked at the end, by the aid of which they remove the tears of gum, which collect in balls of varying size. When the work to be done lies within so small a compass that in the middle of the day the collectors can return to the wells without too much loss of time, they carry only a small bag made of skin, into which the balls of gum are placed. But if the outskirts of the forest have been explored, and it be necessary that the collectors penetrate further into the interior, another bag containing a small provision of water is also taken. But the master never allows the slave to carry any food with him, stimulating him to greater exertions by the promise, too often broken, of a good feast on his return. Should the unfortunate captive not have gathered the prescribed quantity by the evening, and, exhausted by hunger and the burning heat, dare to eat any of the gum he has collected, he is mercilessly beaten. The first collection of gum finishes in December: a second is made in March. The latter is more abundant in proportion as the winds have been stronger and more prolonged during the year; that is to say, the branches previously distended by the humidity of the rains have become more thoroughly dried, and crack more deeply and in a greater number of places. The trading in the gum is effected in the months of January and March; the tribe abandoning the forest as soon as the collection is finished, and resorting to the market. In disposing of the gum the Moor shows a considerable amount of avarice, selling it in small portions at a time, and going from ship to ship on the chance of obtaining a better price.

In the time of Adanson, about 1760, the quantity of gum exported from Senegal was nearly 30,000 quintals, or 900,000 kilograms; in 1827, a very bad year for collection, the exportation amounted only to 613,500 kilograms. But since the Moors have taken more precautions for preserving the forests from fire, the production of gum has greatly augmented, and in 1868, 2,763,618 kilograms were exported from Senegal. In fact, the amount of 3,000,000 kilograms has frequently been surpassed.

Probably it would be possible, with the aid of the blacks, to create plantations of gum trees in the vast extent of country which forms the centre of the Senegambian triangle. Such a result would have a direct effect on the amount of production, and would tend to prevent the sudden and unexpected rises in the price of gum which every now and then occur.

The vereck (*A. Verek*) produces a hard, black-veined wood, which could be used for ebony work; it is especially a gum-yielding tree, and abounds in Senegambia.

Comptonia Asplenifolia. R. T. Chiles. (*Amer. Journ. of Pharm.*, 1873, 304.) This plant which belongs to the order *Myricaceæ*, is esteemed in domestic practice as a mild astringent tonic, possessing considerable alterative properties, and has been used with great success in diarrhœa, dysentery, and the bowel complaints which are so prevalent among children during the summer months.

All parts of the plant possess a resinous and spicy odour, which is increased when the plant is rubbed, but the leaves and young branches only are used in medicine.

Preparations: decoction, infusion, syrup, and fluid extract. According to the author's analysis, the leaves contain albumen, sugar, tannin, gallic acid, gum, extractive resin, volatile oil, fatty and waxy matter, lignin, and a substance having properties analogous to saponin. The ashes of the leaves amount to 5 per cent., and contain potassium, calcium, iron, silica, chlorine, sulphuric acid, and carbonic acid.

Cortex Amygdali Persicæ. J. Howard McCrea (*Amer. Journ. Pharm.*, 1873, 302.) The author collected the peach-tree bark in the latter part of May, and drying it in the air, found it to lose $33\frac{1}{3}$ per cent. By analysis he proved it to contain tannin, albumen, starch, gum, lignin (about 50 per cent.), hydrocyanic acid, resin soluble in alcohol and insoluble in ether, fat, extractive matter, and a potassium salt. The bitter principle was not isolated; it appears to be different from phloridzin, as the author failed to obtain it by the process for this substance.

From the large amount of tannic acid found in the bark, the writer thinks that it might class very favourably with the officinal astringents, though at present it is only used on account of its hydrocyanic acid.

A tincture is made from it by percolation, in the proportion of two troy-ounces to the pint.

Composition of Juniper-berries. E. Donath. (*Neues Jahrbuch der Pharm.*, xl., 37.) One hundred parts of the berries were found to contain—

Water	29.44
Volatile Oil	1.91
Formic Acid	1.86
Acetic Acid	.94
Malic Acid (combined)	.21
Oxalic Acid	traces
Waxlike fatty matter.	.64
Green Resin (from ethereal solution)	8.46
Hard brown Resin (from alcoholic solution)	1.29
Bitter principle, called Juniperine	.37
Pectine	.73
Albuminous substances	4.45
Sugar	29.65
Cellulose	15.83
Mineral substances	2.33
	<hr/> 97.11

The Botanical Source of Santonica. Prof. Willkomm. (*Vierteljahresschrift f. pract. Pharm.*, xxii., 83.)

Nothing was known so far of the botanical origin of the Levant wormseed beyond the fact that it is obtained from a species of *Artemisia* belonging to the section *Seriphidium*, Bess. The author received from Prof. Petzold, of Dorpat, who had travelled through Turkistan, a great number of plants collected in that country, and among these were numerous specimens of the true mother-plant of the Levant wormseed. A careful comparison of the flowerheads (calathidia) of this *Artemisia* with the Levant santonica as imported by way of Russia, left no doubt as to their identity.

This Turkistan plant is an entirely new species of *Artemisia*, and is readily distinguishable from all allied species (*A. Cina*, Berg.; *A. pauciflora*, Stechm.; *A. Lercheana*, Stechm.; *A. monogina*, Kit.; *A. Sieberi*, Bess.; *A. maritima*, L.; *A. gallica*, Lam., etc.) by its naked leaves and involucreal scales, those of the other species being more or less fringed with hairs.

The involucreal scales and the petals of every species of *Artemisia*

belonging to the section *Seriphidium* are more or less beset with vesiculate papillæ, containing a resinous, strongly aromatic substance (the seat of the santonin) which are the more numerous, the younger the calathidium. In none of the above mentioned species are these papillæ as numerous as in the real mother-plant of the Levant wormseed, and this explains the great superiority of the latter as a vermicide over all other kinds of santonica.

The mother-plant of Levant santonica is an erect shrubby plant with a thick twining stem, having a fibrous bark, and giving off numerous woody branches, which are from 3-5 decimetres long, and are covered with a shining yellowish smooth epidermis. These branches give off numerous slender branchlets, forming a very acute angle with the primary axis, and bearing numerous calathidia, arranged in the form of simple or compound spikes. The lower leaves are 4-6 centimetres long (including the petiole), and have greyish green, naked, oblong, bipinnatifid laminæ, with a thick midrib on the lower and a longitudinal furrow on the upper surface. The petioles are flattened at the base, and partially encircle the branch; they give off short tufts of tomentose leaves from their axils. The upper leaves are pinnatifid, have shorter petioles, and give off short tufts of naked leaves from their axils. The flower-heads are oblong, three millimetres in length, and consist of twelve involucre scales, with broad transparent scarious margins, and green midribs, which are densely fringed on both surfaces with numerous resinous papillæ; especially so on the upper scales, in whose axils the florets, from three to six in number, are placed, and generally arranged in pairs. The lower scales are ovato-elliptical; the upper ones are linear, naked, shining, and much longer than the lower ones. At the time of opening, the florets are about 1-1.4 millimetres long. Their obovate, somewhat flattened ovary is hardly one fourth the length of the reversely conical corolla, whose obtuse triangular apexes as well as the base of the tube are covered with resinous papillæ, which, however, are smaller than those on the scales. The stamens have short filaments, and project considerably beyond the club-shaped stigma; the short cylindrical style is surrounded by a sheath consisting of transparent vesiculate cells with extremely thin walls. This sheath, which disappears after some time, is not peculiar to this plant, but has also been observed round the style of *Artemisia Barellieri*.

In conclusion the author proposes that the mother-plant of Levant wormseed be called *Artemisia Cina*, the name recommended by Berg.

Mustard and its Adulterations. Dr. A. H. Hassall. (Abstract of a paper on *Food, Water and Air*, for Feb., 1874; *Pharm. Journ.*, 3rd series, iv., 669.)

The mustard of commerce when pure and genuine, consists usually of a mixture in different proportions of the farina, with more or less of the husk of the seeds of brown and white mustard, *Sinapis nigra* and *S. alba*, plants belonging the natural order Crucifera, which contains a number of other plants that furnish pungent seeds. Sometimes it is made wholly from the brown seed, and at others the farina of the white mustard seed is the principal constituent.

Of these seeds no very complete quantitative analyses have as yet been made, although many highly important particulars have been ascertained respecting their composition. Thus, black or brown mustard as it is now generally named, consists for the most part of *fixed oil*, *myronic acid*, $C_{10}H_{19}N, S_2O_{10}$, combined with potash, forming *myronate of potash*, *vegetable albumen*, a *bitter principle*, a little *gum* and *sugar*, a *peculiar green substance*, *cellulose*, and *mineral matter*. The myronic acid is converted into the volatile oil of mustard, *sulphocyanate of allyl*, C_4H_5NS or $\left. \begin{matrix} CN \\ C_3H_5 \end{matrix} \right\} S$, through the agency of the *myrosin*, another constituent of brown mustard, when the two are brought into contact through the medium of water.

White mustard differs essentially in its composition from brown it contains *fixed oil*, but in lieu of myronic acid, convertible as described into the volatile oil of mustard, a non-volatile bitter and acrid salt, termed *sulphocyanate of sinapine* ($C_{17}H_{24}NSO_5$, or $C_{16}H_{23}NO_5, CNHS$), *myrosin*, *gum*, *cellulose*, and *mineral matter*.

Now, it is on the volatile oil and the acrid and somewhat bitter salt, that the pungency and acidity of mustard depend; and this is a strong reason why in the mustards of commerce the farina of the two species should be blended together. Of the two active principles the volatile oil is by far the more important, and hence the seed of the brown mustard possesses the greatest commercial value. Messrs. Henry and Garot affirm that brown mustard, as well as the white, contains the acrid principle; this statement the author has been able to abundantly verify, especially by the action of nitric acid, caustic potash, and ferric chloride on the alcoholic extract.

The acrid principle of white mustard appears to possess but little stability, and although it is stated by V. Babo to bear a temperature of $130^\circ C.$, Dr. Hassall finds that it is readily affected by heat, and that it is not safe to evaporate the alcoholic solution containing it

at a higher temperature than about 90° F. If subjected to a much higher temperature it quickly loses its acidity, and acquires a bitter caramel-like taste.

Of neither brown nor white mustard has any percentage analysis been given, and in the few cases in which the quantities of any of the constituents are stated, they vary greatly according to different observers. Thus, according to Pereira, the *fixed oil* forms about 28 per cent. of the seeds of black mustard, while Watts puts the yield at 18 per cent. only; but white mustard seed, he says, furnishes 36 per cent. The *volatile oil* amounts to 0·20 per cent. according to Boutron and Robiquet; 0·55 per cent. according to Aschoff; and 0·50 per cent. according to Whittstock; all which quantities are much below the mark. There is little or no difference in the amount of fixed oil furnished by the two descriptions of mustard; that obtained by the author from the farina of brown mustard reaching 35·701 per cent., and that from the white mustard 35·768 per cent. Again, it is shown by the analysis given below, that the volatile oil occurs in much larger quantities than those enumerated above, the amount which the author obtained from one sample being no less than 1·271 per cent.

The following are original percentage analyses of both brown and white mustard :—

Brown Mustard Farina.

Water	4·845
Fixed Oil	35·701
Myronic Acid	4·840
Myrosin and Albumen	29·536
Acrid Salt	3·588
Cellulose	16·765
Ash	4·725
	<hr/>
	100·000
 Volatile Oil	 1·271
Nitrogen	5·068
Sulphur	1·413

The oil extracted by ether from the brown seed is of a bright and beautiful emerald-green colour, owing to the presence of the peculiar green principle described as one of its constituents. So deep and remarkable is this colour of the oil that it would be very easy, by means of a graduated scale of tints, to determine with very tolerable certainty the percentage of brown mustard contained in

any sample of mixed mustard. The small quantity of sugar found in mustard would, from the method of analysis pursued, be found with the bitter principle, and the gum with the cellulose.

White Mustard Farina.

Water	5.360
Fixed Oil	35.768
Acrid Salt	10.983
Myrosin and Albumen	27.484
Cellulose	16.295
Ash	4.110
	<hr/>
	100.000
Nitrogen	5.285
Sulphur	1.224

These analyses, whether regarded from a scientific or practical point of view, are possessed of much interest. The fixed oil was obtained by exhaustion with ether, and it was found in all cases to be free from acidity or pungency. The volatile oil was determined by distillation into a strong solution of ammonia, after maceration of the mustard in water for some hours. The oil evolved was slowly acted upon by the ammonia, and after some hours was entirely dissolved. It was recovered from the solution by evaporation, in the form of the crystalline sulphocyanate of allyl

ammonium, $\left. \begin{matrix} \text{CS} \\ \text{C}_3\text{H}_5 \\ \text{H}_3 \end{matrix} \right\} \text{N}_2$; and lastly, from this the quantity of myronic acid present was calculated. The next steps in the analysis were to obtain the total amounts of nitrogen and sulphur in the mustard; the first was ascertained by combustion with soda lime in the usual manner; and the second by deflagration of the mustard and oxidation of its sulphur in a mixture of nitrate of potash and carbonate of soda. The acrid principle and the myrosin and albumen were then thus approximately ascertained:—As much sulphur and nitrogen were first deducted from the totals of these substances obtained as was necessary to the formation of the volatile oil actually found; next, the whole of the remaining sulphur, and as much of the nitrogen as was required, were then calculated into the acrid principle; lastly, the surplus nitrogen was calculated into myrosin, which has the same formula as vegetable albumen. But now having got approximately the amounts of acrid principle and myrosin, a further calculation had to be made. Myrosin contains

about 1 per cent. of sulphur; this had to be deducted from the total acrid principle, thus liberating from that principle a small quantity of nitrogen, which in its turn was calculated into myrosin.

Both the brown and white mustard farina, after the removal of the fixed oil by ether, were successively treated with cold and boiling alcohol. In the case of the brown mustard the alcoholic extractive amounted to 13·36 per cent., and that of the white mustard to 12·11 per cent. The nitrogen and sulphur in both these extracts were determined, and, as might have been expected, since myronate of potash is to some extent soluble in rectified spirit, more sulphur was found in the case of the brown mustard than was required to combine with the quantity of nitrogen found, but it furnished by calculation 3·82 per cent. of acrid principle, while the white mustard yielded 5·41 per cent. of that principle only. It will be observed that in both cases the amount of total extractive obtained is much greater than can be accounted for by the amount of the acrid salt actually present, and the difference is probably in part due to a little sugar as well as other undetermined substances.

It will be noticed that no reduction of the sulphur existing in the form of sulphuric acid has been made in these calculations. The reason of this is that the quantity of sulphur met with in this form is so small as to be practically of no consequence. Thus, the sulphuric acid obtained from 100 parts of black mustard was only 0·0883 of a grain = 0·0353 of sulphur, while the same quantity of white mustard furnished 0·0560 grain of sulphuric acid = 0·0224 of sulphur.

In the original paper six analyses of farinas consisting of mixtures in different proportions of black and white mustard are given.

That all these samples were genuine was shown by the quantities of fixed oil, nitrogen, and sulphur obtained; and that they consisted of mixtures of the two mustards in different proportions—the higher qualities containing larger proportions of the brown mustard—was demonstrated by the different quantities of volatile oil obtained.

Analyses are also given of some mixed or adulterated mustards of different qualities. The analyses were conducted as in the case of the genuine mustards, the only difference being that an allowance was made for the nitrogen of the wheat flour.

From an examination of these analyses it is apparent that genuine brown mustard should contain about 36 per cent. of fixed oil, at least 1 per cent. of volatile oil of mustard, about 4 per cent. of acrid principle, and that it should furnish about 1·5 per cent. of sulphur,

and 5 per cent. of nitrogen; that genuine white mustard should yield about the same amount of fixed oil, over 10 per cent. of acrid principle, and nearly the same amount of nitrogen and sulphur as the black; that the composition of genuine mustards, which are made up in various proportions of brown and white mustard seed, differs according to the quantities of each kind present, the relative proportions being determinable by analysis with considerable precision; that in the mixed or adulterated mustards the proportions of fixed and volatile oil, of nitrogen and sulphur are all much reduced, according to the extent of the admixtures, these consisting in the mustards now reported upon, in all cases, of wheat flour and turmeric. Thus, the fixed oil was reduced in one of the samples from 36 per cent.—the normal amount—to about one-half, or 18 per cent.; the volatile oil to 0.1 per cent., and the nitrogen to 3.32 per cent.: while in another sample the sulphur was as low as 0.81 per cent. The amount of wheat flour and turmeric varied from 22.98 per cent. to 38.82 per cent., that is to say, from one-fourth to one-third of the article.

It has already been pointed out that the turmeric is added to the mustard simply for the sake of its colour, and to cover and conceal the addition of the wheat flour. In favour of this addition Dr. Hassall believes that not a single reason can be adduced, except possibly that its use allows of the addition of a larger quantity of brown mustard seed than could otherwise be employed at a given price, and that thus the public gain an advantage, wheat flour being, of course, cheaper than white mustard, which, again, is less costly than brown mustard; but this difference of the cost must really be very inconsiderable, and if obtained at the expense of the purity of the article, the practice should be abandoned. At all events, he thinks it wrong and misleading to call these mixed articles by the name of mustard. By making mustard in all cases either entirely of the brown seed or of admixtures of the brown and white seed, a wide range in the qualities and prices of mustard can be obtained, and the mustard in which the white seed greatly predominates can be sold at a very low price. He trusts, therefore, that the time has now arrived for the abandonment of the use of wheat flour and turmeric in the manufacture of mustard, and that, if the sale of the mixtures be still allowed, the law will continue to render it compulsory that the mixed articles should be sold only as mixtures, and not under the name of mustard only. He even regards the manufacture of several varieties and qualities of the same article, as mustard, for example, a very great evil; because the

public suffers in pocket to a large extent thereby, the lowest qualities of these mixtures being constantly sold at the price of the higher, especially in poor neighbourhoods.

Note on the Bark of *Cephalantus Occidentalis*, L. Edgar M. Hattan, G.P. (*Amer. Journ. of Pharm.*, 1874, p. 310.) The bark of the buttonbush or pond dogwood was brought to the writer's notice by an article in the *American Journal of Pharmacy*, 1872, 195, where it is stated that the bark has been repeatedly recommended as an expectorant useful in consumption. In the U.S. Dispensatory, it is said to be laxative as well as tonic, and to have been given in periodical fevers.

The buttonbush or swamp dogwood belongs to the natural order Rubiaceæ; is a shrub growing to the height of ten or fifteen feet, and is found in Canada and the United States, growing in swamps and on the margin of ponds and brooks. The flowers are white, and congregated in peduncled spherical heads, which give to the shrub quite a characteristic appearance.

The author gives a detailed account of his analysis of the bark, the results of which show that its proximate constituents are a crystallizable fluorescent acid, a bitter principle (uncrystallizable), a principle resembling, saponin, tannin, two resins, fatty matter, gum, glucose, and starch.

Two troy ounces of the bark were incinerated, and yielded twenty-four grains, or $2\frac{1}{2}$ per cent. of ash, which contained carbonic, sulphuric, phosphoric, and silicic acids; potassium, sodium, calcium, magnesium, and iron bases.

Indian Hemp and its Preparations. (*Pharmacist*, vii., 113; from the "Official Catalogue of the Indian Department at the Vienna Universal Exhibition.")

The dried leaves of bhang are sometimes smoked alone or mixed with tobacco; but the more common form of taking bhang is to make it up with flour into a cake, or a majun or sweetmeat, which has a green colour. There is also a common method for habitual drinkers of "banghi," viz., of infusing the leaves in cold water and pouring off the clear liquor through a cloth strainer.

The eating of these sweetmeats by persons unaccustomed to them produces the most violent mania and excitement, and the eyes become red and inflamed.

The common majun, to be met with in the bazaars, is often merely sugar, perhaps with ghi, and the bhang without the other ingredients.

The principal forms in which hemp is found in the markets of

the East are: 1, haschich; 2, bhang; 3, gunjah; 4, churrus; 5, a variety of electuaries, pastes, etc., in all of which butter or some other oleaginous matter is the basis of formation.

1. The first, or haschich, is the Arabian name given to the dried tops of the plant grown in Upper Egypt; the meaning of the word being "herb," or "herbe par excellence." The tops are gathered some time before the seeds are come to maturity.

2. Bhang is an Indian preparation, consisting of the larger leaves and capsules which, according to Dr. O'Shaughnessy, is the cheapest form used in India, and therefore in common use among the lower orders for smoking, etc.; from it is prepared an intoxicating drink, and it forms a part of the confection called majoon.

3. Gunjah is the chief Indian form of the dried plant, and consists of the dried tops of *Cannabis* after flowering and from which the resin of the leaves has not been removed; it is chiefly sold in the Calcutta bazaars for smoking, in bundles two feet long, and three inches in diameter; the colour is dusky green, the odour agreeably narcotic, the whole resinous and adhesive to the touch. The specimens examined consist of a central stem with branches, round which are aggregated elongated oval masses about $1\frac{1}{2}$ inch long, and closely pressed together by adhesive resinous matter. When steeped in water these masses can be teased out, and are found to consist of the tops of the plant—that is, the flowers, fruits, and smaller leaflets.

4. Churrus is the resinous secretion alone, and is, therefore, the most powerful shape in which hemp may be used; but it is at the same time expensive, and is not met with in Europe, except as a museum specimen. The specimens in Dr. Christison's museum are variously sized nodulate round masses, from the size of a pea to that of a walnut, and of greenish black colour. It is collected during the hot season by scraping the leaves and tops. Dr. O'Shaughnessy states that in Central India and Nepal the resin which adheres to them is then scraped off. And Dr. McKinnon states that in Nepal the resin is gathered on the backs of the native coolies. Dr. Royle says, "The glandular secretion is collected from the plants on the hills by the natives pressing the upper parts of the young plants between the palms of their hands, and scraping off the secretion which adheres."

5. In the preparation of the electuaries, etc., butter is used as the means of separating the active principle, consequently these compounds are very apt to become rancid.

They are thus described by M. Charnac in the *Annuaire de*

Théráp. for 1846: 1. Preparations mixed with honey or melted sugar. 2. A more active form called *haschich kova-mesk* (musked drug), containing musk, essence of roses and almonds, of pasty consistence, and of the colour of impure honey; the quantity used being the size of a walnut. 3. Two kinds are found at Smyrna, called Israel, the one a fine powder, the other a roll of firm mastic consistence. 4. A black, round kind has great aphrodisiac repute among the fellahs, but in this case it is found that *cantharides* is added to increase the effect.

At Cairo the compound from which the various conserves are prepared is thus made. Equal parts of well sifted *haschich*, butter, and water are put in a vessel on the fire; after some boiling, the water is dissipated, the residue is twisted in a cloth to isolate the fatty matter, and to this the different spices are added.

Haschich is to the Arabians what opium is to the Turks and Chinese. *Hachach*, signifying in Arabic drunkard, is the epithet applied to those who eat *haschich*.

The Arabians smoke the powdered plant, free from seeds, which contain fatty, disagreeably tasting matter, along with tobacco.

Resina Podophylli. Fred. B. Power. (*Chic. Pharm.*, vii., 6, 174.) The writer, after proceeding according to the process of the Pharmacopœia, for the preparation of resin of may-apple, found the amount of soluble matter abstracted by the alcoholic menstruum, to be about 4 per cent., and after repeated washings in cold water, there remained about 3 per cent. The same result was obtained from several operations with selected rhizomes.

The mother-liquor remaining after the precipitation of the resin, together with the washings therefrom, was concentrated by evaporation, when a portion of resinous matter separated, which was found to be entirely soluble in alcohol, but only partially soluble in ether, which separated it into two portions. The portion insoluble in ether was, by experiment, found to be only slightly cathartic in five-grain doses, and attended by no unpleasant effects, while the ethereal resin taken in the same amount proved to be an active emeto-cathartic, very violent in its action, attended with severe griping, a sense of dryness in the throat, and dilation of the pupils, the effects lasting about twenty-four hours. This is considered identical with the first precipitated resin, which it is demonstrated is not a true resin.

The residue contained in the percolator, after exhaustion by alcohol, was macerated with cold water for five days, filtered, and evaporated to the consistence of an extract, possessing a sweetish

odour, in colour and taste closely resembling English extract of taraxacum. This was taken in doses of ten to twenty grains, producing only slight laxative but decided tonic effects. Although proving that the rhizome, after exhaustion by alcohol, is almost destitute of cathartic properties, yet the extract obtained in this way may merit some application.

Prof. Maisch in his remarks on the foregoing, says that several years ago in endeavouring to determine the amount of berberina in the officinal resin, he treated it with boiling water, which almost completely dissolved it, and berberina was not discovered. This observation was conclusive proof that the term resin is a misnomer, although it is the best descriptive term that, in our present state of knowledge, can be applied. But the behaviour of water as indicated, appears also to point to a method whereby the constituents of this so-called resin, may be separated from each other, or their complete separation be verified.

Examination of Ylang-Ylang. H. Gal. (*Neues Jahrbuch der Pharm.*, xl., 167.) The essential oil known as ylang-ylang, and now so highly esteemed as a perfume, is obtained by distillation from the flowers of *Unona odoratissima*, a tree growing in the Antilles and Jamaica, and belonging to the Annonaceæ. It has a specific gravity of 0.980 at 15° C., and turns the plane of a ray of polarized light to the left. When distilled, it passes over at temperatures varying from 160° to 300° C., leaving no residue. It is insoluble in water, partially soluble in alcohol, and completely soluble in ether. The portion insoluble in alcohol, which amounts to about one-fourth, appears as a semi-fluid transparent mass when its solution in ether is evaporated.

Nitric acid acts very energetically on ylang-ylang even in the cold; dense vapours are given off during its action, and upon the subsequent addition of water a resin is obtained which presents a great analogy to that resulting from the action of nitric acid upon benzoin. Bisulphite of sodium produces no action on the essence. Solution of hydrate of potassium of sufficient strength, when acting upon it at a somewhat elevated temperature, gives rise to a kind of saponification, and ultimately to the formation of a white substance insoluble in water, provided the action is allowed to proceed for a sufficient length of time, and with repeatedly renewed quantities of solution of potash. The addition of hydrochloric acid to the portion dissolved by water caused the separation of a crystalline body, which the author's experiments proved to be benzoic acid.

The part insoluble in solution of potash, when distilled with water

and then separated from it and rectified, yielded a substance the boiling point of which was as variable as that of the original essence. Treatment with anhydrous phosphoric acid converts this substance into an odourless liquid. Iodide of phosphorus also reacts upon it with considerable energy, causing the formation of a liquid heavier than water, and having a piquant odour. These reactions point to oxygenated compounds of the nature of alcohols, with which the benzoic acid may be supposed to exist in the essence in combination as benzoic ethers. This appears the more likely, as ylang-ylang does not contain the benzoic acid in the free state, and because the author could not obtain from it an alcohol soluble in water by distillation with caustic potash.

Cultivation of Opium in India. R. Saunders. (*Pharm. Journ.*, 3rd series, iv., 652; from the "Official Catalogue of the Indian Department at the Vienna Universal Exhibition.")

The poppy plant has been cultivated in Nepaul for many years, doubtless for as long or longer than in Bengal and the North-Western Provinces; and it may be, that the opium from India was first introduced into China by the Nepaulese, and afterwards by the Dutch, who used to purchase the drug for export, long before the East India Company held possessions in this country.

About the end of January, the petals are watched, carefully collected and dried, and subsequently used as coverings for the opium cakes.

In February or March, the pods generally mature, and are lanced in the afternoon; the opium is allowed to exude and remain on the pod till the next morning, when it is scraped off gently with a small iron scraper, and the thumb or finger is then run over the incisions to close them. The number of incisions required to complete exudation of all the juice varies, and ranges from one to five and six, and occasionally to seven or eight in some isolated cases. The opium thus collected is placed in earthen or brass vessels slightly tilted to drain off the dew or any opium juice it may contain; and when the whole of the drug is collected and thus treated, it is carefully manipulated, put into a new earthen pot, and set aside in some ventilated and safe place. Should the opium be of low spissitude, it is exposed in some shady place (not in the sun), turned over occasionally and very carefully, so as not to injure the grain, and is so treated till it reaches the required consistence; and remains in the custody of the cultivators until it is weighed.

After the opium has been brought in by the cultivators, it is tested, and samples of each consignment are taken for a careful

chemical analysis to the opium examiner's room, to detect adulteration. The opium is then stored in large wooden vats.

The pure opium, which is fit for the Chinese trade, and the consumption of the local market, is stored in large wooden vats, each holding about fifty maunds (about one and a half ton weight); the opium derived both from the Asameewar and Chullan sources is not stored anyhow, but each parcel, according to its class, is emptied into a vat bearing the designation of that class; the light divisions are arranged in lines.

As much opium as can be removed from the vessels by light scraping is taken; that which adheres is afterwards removed by second scraping, and set aside for lewah; and that which persistently adheres is removed by water—this is called washings, and when evaporated, is used in making lewah; the washings alone are valued at about 6,500 rupees a season at the Ghazeepore Factory, and the opium thus recovered amounts to over one ton in weight.

When a vat is filled, the opium in it is stirred by long wooden poles daily, until the drug is used for caking, which process can be commenced when there are about 2000 maunds stored, if the proper quantities of the various consistencies have been prepared. The producer is bound to cake at a consistence of 70° ; that is when the opium contains 70 per cent. of the pure dry drug and 30 per cent. water; but as it would be difficult to hit off the consistence of 70° exactly when manipulating such a large quantity, a margin of half a degree above and below the standard of 70° is allowed.

To prepare the opium for caking, a certain number of vats are marked of each class; a long iron instrument, something like a cheese-taster, is thrust from the top to the bottom of the vat (it forms half a hollow cylinder when open, and a complete cylinder when shut), and closed; the sample of opium is withdrawn, the contents of the sample are thoroughly mixed up, and three specimens of 100 grains are assayed; the mean of the three results is taken as the correct consistence. By the same process the samples from all the vats, which have been marked, are taken and assayed; those which will give, when mixed together in certain proportions (by rule of alligation), opium at a consistence of $69^{\circ}30'$ or $69^{\circ}40'$ are exported to the alligation vats, and the contents of the selected vats are equally distributed over the seven alligation vats, so that the consistence of each may be uniform. The opium is then well mixed by rakes, and by men walking about in it, and kneading it with their feet. At about 3 p.m. it is removed from these vats into the five caking vats; equal quantities being taken from each of the

seven alligation vats are distributed over each of the five caking vats. On the following morning the opium in each vat is again mixed by six men allotted to each, from 5 a.m. to 8 a.m. Four samples are drawn from each vat, and thoroughly incorporated together, and three specimens from this mass are taken for assay; this pertains to every caking vat. Should the whole of the assays of each caking vat come out above 69.50 and under 70.50, the agent of the Ghazeepore Factory gives the order to cake, or in his absence the principal assistant does so.

A large room, 944 feet long by 27 feet wide, accommodates the 250 cake-makers; each cake-maker has a number, and a place assigned for him to work at, the cake-maker's number being printed on the wall above his seat. Each man is provided with a wooden seat, and is furnished with a brass cake-mould, forming the half of a hollow sphere; he has also a tin vessel graduated so as to hold $4\frac{1}{2}$ chittacks of lewah, the regulated quantity which is used in making the shell of each cake.

The following materials are used in making a cake, and as it is necessary that every cake should be of the same weight, viz., two seers, every precaution is taken to ensure the accurate determination by weight or measure (calculated for weight from actual experiment) of the articles which compose the cake. The proportion of each article is given in the table below.

	Seers.	Chittacks.
Standard Opium at 70	1	7.50
Lewah at 53	0	4.50
Flower leaves	0	5.00
Water	0	0.50
Trash	0	0.25
Total weight of cake on the day of manufacture	2	1.75

The lewah now demands attention. Lewah is a paste made by breaking down opium in water which has been used for removing the traces of opium which adhere to the jars or vessels in which opium has been placed; this is called washings, or technically *dhoe*; the washings contain about 8 to 10 per cent. of opium; the opium is broken down in large vats containing about 800 cubic feet, and about 8 per cent. of pussewah is added to the lewah to render it smooth and glutinous. When the lewah has a consistence of over 52.50 and under 53.50, it is called standard lewah; its consistence is determined every morning by assay, and until it is of the proper degree, caking every cannot commence.

The lewah is delivered in bulk by weight, and the quantity to be used for each cake is measured by a brass cup, which delivers $4\frac{1}{2}$ chittacks at 53° .

The poppy flower-leaves agglutinated by the lewah form the shell of the cake, five chittacks of dry leaves, or a proportionally larger quantity of moist leaves are required for each cake.

Having explained the preliminaries of caking, the method will now be described. Down the centre of the room the scales for weighing opium and the lewah vats are placed; there is a weighman for each scale and two assistants. The weighman weighs the opium on a very delicate scale, and one assistant searches the opium to ascertain finally that there are no extraneous matters in it; the second man arranges the movable tin pan, and places the opium on it.

When caking commences the caking-vat room doors are opened, and the opium is brought out in tinned sheet-iron vessels holding 20 lbs. each. One vessel is set before every scale, and a sufficient quantity for one cake having been searched is handed over to the weighman's second assistant, who adjusts the quantity in the pan. When the weighman declares it to be correct, the tin plate with the opium is taken away by a boy to his cake-maker, who has been supplied in the meantime with a tin cup filled with the requisite amount of lewah for a single cake; he has also received the proper quantity of leaves for one cake.

Having these by his side, the worker now rapidly forms in the brass mould the lower half of the shell of a cake, pasting by means of the lewah, leaf over leaf, until the thickness of about seven-sixteenths of an inch has been obtained. He allows in so doing the upper part of some of the leaves, which he tears in half and places vertically, to hang down outside the mould (with these he forms the upper half of the cake). The cake shell is principally made of half leaves vertically placed, other halves being inserted horizontally, so as to give equal strength in all directions. Having finished the lower half of the shell, he takes the tin plate, and accurately, to a grain, removes the opium into the half of the shell now ready for its reception; it is pressed upwards into the shape of cone, some pieces of leaves are applied horizontally to it, then some lewah; now some of the parts of the leaves hanging down are pulled up and secured, more pieces are applied horizontally, and at last, having pulled up and properly arranged all the pieces of the leaves which were hanging around the cup, a whole leaf is applied to the top, and the cake is now finished.

It is a sphere of about the same size as a 24-lb. spherical shot ; it is removed from the mould, and dusted with a little coarsely powdered poppy trash, so as to prevent its adhesion to the cup—made of burnt unglazed pottery—which is of the same shape as the mould in which the cake was made. It is now carefully placed in the cup while still soft, and it is carried out by the cake-maker's boy, who puts it in the sunshine on a little square of brick flooring, which has been allotted to the cake-maker whom he serves, and where a small board stands bearing his master's number.

Before removal, a paper ticket is pasted on the cake, bearing the cake-maker's number, so that every cake-maker can be held responsible for the careful manufacture of his cakes.

The cakes are, on the evening of the second day, counted and sent to their destination in one of the cake godowns, where they and their cups are stored in racks. The cake godowns are large and high brickwork buildings, with galvanized iron roofing, well ventilated by numerous windows and doorways. Every third day the cakes, wherever placed, come down to the ground, are lightly hand-rubbed with a little trash, turned, replaced in their cups, and sent up again to be placed in the racks. The object of the turning is to allow the shell of the cake to dry evenly.

The cakes are packed during dry weather in strong mango-wood chests, containing forty cakes each. In these they find their way to Calcutta, whence they are shipped to China, where each chest realizes about £13 in an average good season.

Botanical Origin of the Balsams of Tolu and Peru. Professor Baillon. (*Pharm. Journ.*, 3rd series, iv., 382; from *Rep. de Pharm.*, N.S., i., 566).

The plant which yields the balsam of tolu, and which, during the present century, has been described under the name of *Myroxylon toluiferum*, was named by Linnæus, in his "Materia Medica," *Tolui-fera balsamum*, and that name should still be retained for it. The younger Linnæus thought that the balsam of Peru was the product of another leguminous plant of the same genus, which he had received from Mutis, and which he named *M. Peruiferum*. This was an error, since the pretended balsam of Peru did not even come from South America, but from the *Costa del Balsamo*, or Balsam Coast, in San Salvador. The tree which produces the greater part of this San Salvador balsam, is that which Klotzsch, multiplying beyond measure the species of the genus, described as *M. Pereira*, but which cannot be separated specially from *Tolui-fera balsamum* (*M. toluiferum*). Here, as in the entire genus, characters, taken

from the form, size, and proportion of parts of the fruit,—especially of the wing at its base, which varies infinitely in size and direction in one and the same plant,—cannot be held sufficient for the separation of species. The elongated, or more or less punctiform pellucid spots of the leaflets, do not appear as though they ought to be considered to have specific value; hence the slight value of *M. punctatum*.

The different qualities and characters of the balsams seem to depend entirely upon the method of extraction. But all the forms of *J. balsamum* have one constant character in the smooth surface of the seed, which arises from the fact that the cotyledons are not runcinated. On the contrary, in the *M. Peruiferum*, which should take the name of *Toluiifera Peruifera*, they are runcinated. This latter tree yields scarcely any useful products, or at least any sent as such to Europe. The balsamic substance is present, however, on the surface of the seed, as in *T. balsamum*, but in less quality, and it is sunk into the crevices of the seminal envelope, instead of being deposited in a smooth layer. This is the sole difference between the two species of the genus *Toluiifera*.

Chemical Examination of Osha Root. H. Haupt, Jun. (*Amer. Journ. of Pharm.*, iii., No. viii., 347.)

This New-Mexican umbelliferous root, the botanical origin of which is still unknown, has been noticed in the *American Journal of Pharmacy*, 1867, 202, and 1868, 106. The material for the following experiments had been received from Mr. Jacob Krummeck, of Santa Fè, through Prof. Maisch.

On leaving a canton flannel strainer in contact with a hot decoction of the root, the woollen fibres of the strainer were observed to be dyed a reddish brown colour, while the cotton fibres remained white. Dilute sulphuric acid changed the colour to yellowish brown (snuff colour); alum solution (1 to 8) the same; solution of soda and of ferrous sulphate deepened the colour considerably.

Sixteen ounces of the root in coarse powder were distilled with water; the distillate, at first clear, became turbid when quite cool, and separated volatile oil. The aqueous decoction, after the volatile compound had been removed by distillation, was carefully evaporated to a syrupy consistence, and treated with alcohol; the brown precipitate dissolved readily in water, the solution yielding with alcohol a white precipitate of gum, which on exposure to the air again assumed a brownish colour.

A concentrated solution of this precipitate formed stiff jellies with solutions of ferric chloride and of borax; acetate of lead precipitated it white, the filtrate therefrom, after the removal of the lead by

sulphuretted hydrogen, yielded, on evaporation, nearly white deliquescent crystals.

The alcoholic filtrate obtained as above from the decoction, reduced cupric oxide in alkaline solution at the boiling temperature, but not in the cold after standing for several hours. The reduction was probably due to some organic body other than sugar.

The root exhausted by hot water was dried, when it weighed six and a half ounces. It was exhausted with strong alcohol, the tincture distilled and evaporated, and the residue successively treated with petroleum benzin, bisulphide of carbon, and chloroform. On evaporating the last two solutions slowly, resinous masses were left behind without any sign of crystallization. Equal quantities of these resins, dissolved in a like quantity of alcohol, gave solutions of a similar brown shade, but much paler in the case of the bisulphide of carbon resin.

The solution in petroleum benzin separated, on standing, at first a brown resin, in appearance and behaviour identical with that taken up by the chloroform, and after several days particles of fat. The benzin was evaporated, and the resulting oil cooled to 8° F., when it thickened slightly, but did not congeal. The oil was saponified, the soap converted into soda soap, and the fatty acids liberated by sulphuric acid; a brownish gelatinous mass was obtained, which dissolved in alcohol, leaving a small portion of oil behind, which was readily taken up by bisulphide of carbon. The alcoholic solution yielded a precipitate with acetate of lead, which was soluble in ether, and on the evaporation of the solvent the oleate was obtained again as a yellowish semi-fluid mass.

The mother-liquor from the soap was evaporated, and yielded a dark coloured liquid containing potassium and sodium salts. This liquid being difficult to purify, some fat was obtained from the root by treating it with hot benzin, then saponified with oxide of lead, and the mother-liquor purified by sulphuretted hydrogen and alcohol; the liquid finally obtained, although not quite colourless, had the properties of glycerin.

The volatile oil separated from the aqueous distillate mentioned above, was heavier than water, of a light yellow colour, and the sharp burning and aromatic taste of the root. Sodium acted upon the anhydrous oil with considerable violence, slender white needle-shaped crystals being separated on standing. Caustic potassa did not unite with this oil.

A portion of the aqueous distillate, from which the volatile oil had been separated, still retained considerable odour; it was repeatedly

distilled from chloride of sodium, and thus concentrated, the distillate was mixed with a concentrated solution of bisulphite of sodium, and the mixture cooled by ice. No crystals being obtained, the absence of an aldehyde in the distillate was established.

The aqueous distillate being of an acid reaction was neutralized with carbonate of sodium, and concentrated by evaporation, when the colour became quite dark. After purification by animal charcoal and alcohol, and recrystallization, deliquescent crystals were obtained. The salt distilled with an excess of diluted sulphuric acid, yielded a colourless distillate of a pleasant aromatic odour, reminding of the oil of cognac. When almost neutralized by soda, the solution gave no precipitates with sulphate of copper, ferric chloride, or mercurous nitrate.

In order to compare this aromatic acid with angelic acid, the latter was prepared by Buchner's process, by exhausting angelica root with alcohol, evaporating the liquid, separating the balsam, washing it with water, exhausting it with solution of potassa, purifying the compound by repeated concentration and filtration, and distilling with sulphuric acid. Angelic acid was obtained in colourless needles, having a peculiar aromatic odour, reminding of valerian, and being sparingly soluble in cold, but freely in hot water. The lead salt was obtained in shining white plates. 0.07 grams of the lead angelate, having been previously dried at a moderate heat, was decomposed by sulphuric acid, yielding 0.052 grams lead sulphate, containing 0.355 grams lead, which is equal to 54.7 per cent. oxide of lead in the angelate; theoretical percentage 55.17. (See Gmelin's Hand-Book.)

Some osha root was treated in precisely the same manner as the angelica root; the acid obtained did not crystallize. The lead salt was obtained in shining plates, which, on heating, fused into a transparent mass. It was dried together with the lead angelate; 0.02 grams of it yielded 0.019 grams sulphate, corresponding to 0.0129 grams lead and to 69.9 per cent. oxide of lead in the organic salt.

It seems clear from the results as given above that the acid of osha root is not identical with angelic acid; it appears to be a new acid hitherto unknown, and to deserve to be distinguished by the name of *oshaic acid*.

From 100 grains of the air-dried root 8 grains of ash were obtained, containing iron, aluminum, sodium, and potassium.

Anemone Ludoviciana. Frank E. Miller. (*Neues Jahrb. der Pharm.*, 1873, 332; from *Amer. Journ. Pharm.*, 1873, 298.) This plant, which belongs to the order Ranunculaceæ grows abundantly in the neighbourhood of St. Paul, in Minnesota, and is there used

in place of the European *Anemone pulsatilla* and *Anemone pratensis*. Dr. W. H. Miller, of St. Paul, has used it with great success in several chronic diseases of the eye, such as cataract, amaurosis, and opacity of the cornea. It has also been given with good results in cutaneous eruptions, and in secondary syphilis.

The author has subjected the leaves of this plant to a chemical analysis, in which he distilled them with water, and agitated the distillate with chloroform. Upon evaporating the latter he obtained white feathery crystals, having a neutral reaction; but these became discoloured after a few days, and assumed an acid reaction. A distillate, obtained from a mixture of the expressed juice and water, when treated with chloroform, also yielded crystals during the spontaneous evaporation of the chloroform, but the liquid, which was quite colourless at first became dark red after a short time, and in that state was found to be strongly acid to litmus and of a peculiar penetrating odour, very irritating to the nostrils. A few drops of this liquid which were accidentally spilled on the writer's fingers, reddened the skin and soon raised blisters, which caused great pain, and did not entirely disappear for six weeks. After complete evaporation of the chloroform, the residue became of a dark brown colour, although it retained its crystalline form in the centre. The irritation produced on the skin was evidently due to the action of the anemonic acid.

The author repeated his experiments with the remainder of the leaves at his disposal after the lapse of eight weeks, but this time he could not obtain any crystals from the distillate by the treatment with chloroform. Thus it appears very probable that anemonine can only be obtained from the fresh leaves or juice.

In the further course of his investigation the writer detected glucose, pectin, and two resins, one soluble in ether, of an oily character, and the other soluble in water, giving a precipitate with acetate of lead and also with subacetate of lead, but with the latter after the action of neutral acetate.

Brazilian Medicinal Plants. P. L. Simmonds. (*Chem. and Drug.*, 1874, i., 12.)

The following notes on Brazilian medicinal plants were extracted by the author from several special Brazilian Exhibition Catalogues, the French Jury Reports, Brazilian pamphlets, and other sources.

Brazil is a promising country for new pharmaceutical products, a comparatively limited number being as yet known and appreciated in Europe. Some few, indeed, have a general and deserved reputation, among which may be cited ipecacuanha, the emetic root of

Cephaelis ipecacuanha, of which Brazil has the monopoly in the markets of the world, and sarsaparilla (*Smilax*), of which it furnishes one of the best sorts.

Balsam of capivi, furnished by several species of *Copaifera*, and from which as much as twelve pounds may be obtained by one incision.

Copaifera Guyanensis, Dec., and other species are met with in nearly all the provinces of Brazil, but are most abundant in the valley of the Amazon. The oil is obtained from the trees at stated periods.

Benzoin (*Styrax benzoin*), rivalling that of Sumatra and Siam, can be obtained in Brazil.

The odoriferous seeds of *Ay dendron Cuyumary*, Nees, are largely used in medicine, and the tonquin beans or cumaru seeds (*Dipteryx odorata*, Dec.) are well known in commerce for their use in perfumery, flavouring snuff, etc.

From the seed of the fruit of *Myristica Bicuiba*, Schott, a solid fat is obtained, in the provinces of Bahia and Sergipe, which is used in skin diseases.

Then there are the emetic roots of *Richardsonia Brasiliensis* and of various ionidia. The febrifuge barks of *Mikania officinalis*, *Ivonia febrifuga*, *Solanum pseudochina*, and of *Exostemma souzanum*, the latter held in much esteem by the natives, who employ them under the name of quina curitiba and quina di pianchi. *Cassia Brasiliana*, which is scarcely admitted yet into the European markets, is a kind of jalap root produced by two species of *Ipomæa*. *Spigelia anthelmia*, the arababaca of the Brazilians, an energetic poison, but anthelmintic in small doses. The pareira brava, which was long erroneously ascribed to *Cissampelos Pareira*, but which Mr. Hanbury shows now to be produced by *Chondodendrum tomentosum*, R. and P., is the universal medicine of the natives; bitter, and considered as lithontriptic.

The serpent nuts (*Feuillea trilobata*) are considered alexipharmics. The seeds of *F. cordifolia*, Linn., are employed to cure those attacked with tetanus. An oil is obtained by boiling them.

Guarana (*Paullinia sorbilis*), which contains caffeine, is used internally in dysentery and intermittent fevers, and is an esteemed febrifuge of the natives. It has also taken an important place in French pharmacy as a remedy against certain periodical nervous affections. Agoninda and angelim pedra, with their isolated active principles agonidine and angeline alkaloids, regarded as substitutes for quinine, deserve attention in Europe.

From the powerfully astringent bark of *Schirrus antarthriteria*, Mart., a febrifugal principle is extracted. The astringent bark of one of the myrtle tribe is used as medicine on the Amazon, and the astringent seeds of *pajura* in Para.

Gustave Brasiliensis, D.C., has medicinal properties, and the edible fruits of *Genipa Brasiliensis*, Mart., common throughout Brazil, are used in medicine. The seeds of *Bombax gossypifolium* are considered as purgative as those of *Croton tiglium*.

Angelim.—A powder extracted from this plant is used as an anthelmintic in small doses, but in larger quantities it is a powerful drastic.

Arueira (*Schirrus aroeira*), Velt.—The bark is astringent, and from the fruit is extracted a rose tint, which is used in dyeing.

Barbatimao (*Stryphnodendron Babatimao*, Mart.)—The bark and fruits are used in medicine, and also for tanning and dyeing. A decoction of the bark is given internally in diarrhoea, leucorrhoea, etc., and externally in cases of hernia, hæmorrhages, and ulcers.

Cainca (*Chiococca anguifuga*).—A tincture of the bark is used medicinally in small doses as a diuretic and purgative, but is emetic in large doses. It is administered in the treatment of hydropesias, apoplexy, insanity, rheumatism, and syphilis. This root—the “*raiz preta*” of the Brazilians—is used in Europe.

Manaca or *Manacu*.—This shrub is found wild and cultivated. It is considered a remedy for rheumatism and nervous complaints. The powdered roots are administered internally as a diaphoretic, diuretic, antisyphilitic, and emetic. It is given as an antidote to the bite of cobras, but is dangerous in large doses.

Marupahy.—An infusion of the leaves and bulbs is given as a calming medicine in cases of vomiting and violent dysentery. Applied externally it is said to be a good wound healer.

Marupa-miry.—An infusion of the root is given in cases of diarrhoea.

Mastruco.—Herb Santa Maria.—The tincture is used as an antiscorbutic, and an essential oil is obtained from the herb and seeds.

Massaranduba (*Mimnusops elata*).—The fresh white sap furnishes a very savoury milk, which is taken with tea or coffee, or mixed in gruel; it is nutritive, and a good substitute for cow's milk. It is used externally for poultices, and is administered internally as a pectoral and analeptic. The sap congeals in twenty-four or thirty hours, and then somewhat resembles gutta-percha, except that the colour is not dark. It was introduced a few years ago from British Guiana under the name of *balata* gum.

Murure (*Bichetea officinalis*).—The red sap of this “vegetable mercury” is depurative and anti-syphilitic. Found in the provinces of Maranham and Para.

Muirapuama.—The root is considered exciting and aphrodisiac in weak energies, and in the worst cases of local paralysis.

Muiratinga.—The milky sap is applied externally in cases of rheumatism, contusions, etc.

Pao Preciosa (*Mespilodaphne pretiosa*, Nees).—The wood, bark, and seeds, being odoriferous, are useful in medicine and the arts. The seeds, grated, are used internally for dysentery.

Pao-terra (*Qualea grandiflora*, Mart.).—The leaves are medicinal, and their properties have a high reputation in the province of Minas. The tree grows in the interior and the northern part of Brazil. A yellow colour is obtained from the fruit, which may prove of use in dyeing.

Pereiro (*Aspidosperma* sp.).—The leaves are fatal to animals which feed on them, but maize is said to be an antidote to the poison.

Pepino.—The sap is applied externally against rheumatic complaints, and internally in disorders of the stomach. It furnishes a resinous product which is used as a varnish.

Sucuuba (*Phimeria phagedemica*, Mart.).—The milky juice is used in the Amazon valley as a vermifuge, administered in coffee with castor oil. It is also applied externally in rheumatism, and for the cure of ulcers, boils, dislocations, etc.

Tamaquare.—A species of laurel. The balsamic oily sap is used for skin diseases, and an oil obtained from the seeds is said to cure herpes, rheumatism, and other complaints.

Tinguaciba (*Xanthoxylon spinosum*).—The bark and root are used in the southern provinces as an antidote to snake bites.

Unany, a species of *Siphonia*, produces a black elastic gum, which is used in medicine as a vulnerary.

Umery (*Humirium floribundum*, Mart.).—From the distilled bark and wood a yellow limpid balsam is obtained of an agreeable odour, which is used in medicine, like the balsam of Peru, in cases of derangement of the stomach.

Uacauan-caa.—The leaves are used medicinally in cases of rheumatism, syphilis, and derangements of the stomach, and are considered an antidote to snake bites and other venomous poisons.

Uichi.—The astringent bark is used medicinally, and from the pulp of the fruits the natives obtain an oil, which they use for burning.

Pinawar-Djambé. Dr. Legedank. (*Journ. de Méd. et de Pharmacol. de Bruxelles*, vi., 63; *Archiv. der Pharm.*, 1873,

263.) *Pinawar-djambé* or *penhawar-djambé* was mentioned by Cantani, in an essay on *Hæmophilia* as a valuable styptic used in the East Indies, whose botanical sources were erroneously stated to be *Cibotium glaucosum* and *Agnus vegetabilis*.

The author gives a description of two different kinds of pinawar, viz.: *pinawar-djambé* obtained from *Cyathea Smithii*, and *pakoe-ridang* obtained from *Aspidium Baromez*; both belong to the natural order Filices. *Pinawar-djambé* occurs in Sumatra, Timor, and Amboina, and reaches us by way of Turkistan and Russia. When dried and ready for export it presents the appearance of pale red, fine woolly hair, which a microscopic examination shows to consist of long thin single hairs devoid of any cell contents. The cell membrane is smooth and shining, and has the same chemical composition as cork; it also contains traces of a resinous substance. Fig. 1 (see original essay).

Much more esteemed is the true pinawar, called by the natives *pakoe-ridang*, which occurs in Borneo, Malacca, and in the equatorial zones of the Indian Archipelago. It occurs in long, dark-brown, golden, shining hairy tufts, whose single hairs are multicellular and thicker than those of pinawar; the cells of each single hair are arranged in one row. The hairs are rigid, and felted into imperfect clews. Here, too, the microscope shows no cell-contents; the cell-walls are thicker than in pinawar. Fig. 2 (see original essay).

Fig. 3, in the original essay, represents a scale from the rhizome of *Neptuodium Filix mas*, a glance at which suffices to show, that pinawar and pakoe are epidermal appendages, appertaining to the fronds—not to the rhizomes—of *Cyathea Smithii* and *Aspidium Baromez*.

The assumption that pinawar is a parasitic fungus, and as such a similar hæmostatic to *Agaricus ignarius* has thus been completely disproved by the author's researches.

The value of the two species of pinawar depend upon their lightness, their hygroscopic nature, and the antiseptic properties of the resin contained in them.

Areca Catechu. (The Areca Palm.) John R. Jackson, A.L.S. (*Pharm. Journ.*, 3rd series, iv., 689.) Some interest having lately arisen among pharmacists with regard to the areca palm (*Areca catechu*, L.) owing to its proposed introduction into the British Pharmacopœia as an officinal plant, a few notes on the tree itself and its uses may not be out of place.

The areca palm is a handsome tree, growing to a height of from forty to sixty feet, with a slender, erect trunk, averaging from one

to two feet in circumference. It has regular, pinnate leaves, and long, linear leaflets, of a rich, dark-green colour. The circumference of the trunk is annulated or distinctly marked with the scars of the clasping petioles of former leaves. The fruits are each about the size of a hen's egg, consisting of a fleshy looking drupe, which, however, on cutting is found to be very fibrous, containing a seed about the size of a nutmeg, and like that well known spice, rubricated or marked with thick, reddish-brown irregular lines throughout its entire substance. These fruits are borne in large bunches, springing from the crown of leaves. The spathe itself is used in some parts for making drinking vessels, for nailing over the bottoms of boats, and various other purposes.

The tree is known best as the betel-nut palm, and is cultivated in nearly all the warmer parts of Asia for the sake of the seeds, which are not only chewed in large quantities by the natives in countries where they grow, but are shipped to countries where the palm is not cultivated. The average annual produce of one tree is said to be about three hundred nuts. The tree is largely cultivated all over India, as well as in China, but is more abundant, perhaps, in Malabar, North Bengal, the lower slopes of the mountains of Nepaul, and the south-west coast of Ceylon. In Travancore alone there are nearly ten millions of these trees, the annual value of the produce of which is estimated at £50,000 sterling. It is said that about 80,000 piculs of the nuts are annually produced on the coast of Sumatra. Many varieties of the betel-nut palm are known to the natives under different local names; the nuts also vary much in size, but their quality depends upon their appearance when cut through, "intimating the quantity of astringent matter contained in them. If the white or medullary portion which intersects the red or astringent part be small, and has assumed a bluish tinge, and the astringent part is very red, the nut is considered of good quality; but when the medullary portion is in large quantity the nut is considered more mature, and, not possessing as much astringency, is not esteemed so valuable."

The nuts are usually gathered between the months of August and November. The seeds are removed from the husk and boiled in water. In the first boiling the water becomes red and thick, and this is afterwards evaporated into catechu, but whether it is imported into this country as a commercial article is uncertain. The mode of collecting the catechu in Mysore is thus described:—"The nuts are taken as they come from the tree, and boiled for some hours in an iron vessel. They are then taken out, and the remaining water

is inspissated by continual boiling. This process furnishes *kossa*, or most astringent *terra japonica*, which is black, and mixed with paddy husks and other impurities. After the nuts are dried they are put into a fresh quantity of water and boiled again, and this water being inspissated, like the former, yields the best or cleanest kind of catechu, called coony. It is yellowish-brown, has an earthy fracture, and is free from the admixture of foreign bodies."

For the purpose of chewing, the nut is cut into narrow strips, and rolled up with lime in the leaves of the betel pepper. The mixture has a hot, acrid taste, and aromatic and astringent properties. The habitual use of the betel-nut is considered by the natives to be very wholesome, but the effects are said by some to be due as much to the ingredients used with it as to the areca-nut itself. Its constant use causes the teeth to become black and the mouth and lips of a brick red colour. In some parts of China the nuts, bruised and powdered, are mixed with the green food given to horses, and they are thus considered a preventive against diarrhoea. In the north of China small pieces of the nut are boiled, and the decoction is taken as a domestic remedy in various visceral affections.

Though the use of the betel as a masticatory turns the teeth black, it is said to preserve them from decay in a remarkable manner, and this may be the reason why some English chemists have introduced the pulverized charcoal into this country as a tooth powder.

In Borneo, the flowers, which are fragrant, are mixed with medicines, and used as charms for the cure of many diseases. In some parts of India the juice of the young tender leaves mixed with oil is applied as an embrocation in cases of lumbago, and a decoction of the root is a reputed cure for sore lips; so that whatever may prove to be the value of the areca nut as an anthelmintic in this country, it is certain that the tree is much esteemed for its numerous uses in the East.

Trompatilla, a Remedy for Hydrophobia. John M. Maisch. (*Amer. Journ. Pharm.*, Feb., 1874, 51.)

A sample of this drug was received by the author from Mexico, where it is said to be successfully used for the prevention and treatment of hydrophobia, for which complaint it is freely given in the form of decoction. It is stated to be obtained from *Bouvardia triphylla*, and consists of short segments of the stem and branches, varying from one-fourth to three-fourths of an inch in diameter, terete and slightly bent. The bark is thin, fragile, brown, and

separates in a few pieces very readily from the wood, but adheres firmly to it in the largest number. The bark is covered with a comparatively thick layer of soft friable cork, which is rust-brown within, externally grey to blackish-brown, and marked with numerous shallow longitudinal fissures. The wood is rather hard, but splits easily and straight in the direction of the axis, it shows concentric, somewhat irregular, zones, resembling annual rings, and is radially very finely striate from the numerous very fine medullary rays. The duramen has a purplish-gray tint, the alburnum is yellowish-white. There is no preceptible odour to either wood or bark; the former is tasteless, the latter has a slight bitterish taste. The central pith is scarcely a line in diameter, and of a brownish to purplish-brown colour.

The genus *Bouvardia* belongs to the natural order Rubiaceæ, tribe Cinchonaceæ, sub-tribe, Cinchoneæ. De Candolle enumerates eleven species, all shrubby plants, and natives of Mexico, having the leaves either verticillate or opposite. The scars on the specimens in question are three or four in a whorl, indicating that the plant belongs to the former section, and is most likely *B. AripHYlla*, Salisbury. The following description is translated from De Candolle.

Bouvardia Jacquinii, H. B. K., small branches triangular; leaves somewhat rough, hairy beneath, smooth above, ternate, oblong; corymbs subtrichotomous; calyx lobes one-fifth the length of the roughish corolla tube; corolla red, the tube $\frac{3}{4}$ inch long; varies with the leaves pubescent and glabrous.

The following synonyms are mentioned in the same place: *Ixora Americana*, Jacquin; *Ixora tenuifolia*, Car.; *Houstonia coccinea*, Andrews; *Bouvardia triphylla*, var. *a.*, Salisbury; and *Ilacoxochilt jasminiflora*, Hernandez.

A new False Angustura Bark. John M. Maisch. (*Amer. Journ. Pharm.*, Feb., 1874, 50.)

The author draws attention to a new false angustura bark, which has come under his observation. He first met with it in the shape of small and very thin pieces, covered with a greyish cork exhibiting patches of an orange shade, while the inner surface was of a dark brown, so as to present at first sight an appearance reminding of the bark of *Strychnos nux vomica*, which is usually designated as false angustura bark. The bark in question, however, is of such a fibrous texture that the idea of its probable identity with the strychnos bark is at once dispelled. The specimens described by the author were seven inches and less in length and one-eighth of an inch or

nearly so in thickness; intermixed with some half quills and a few quills. They consisted altogether of the inner bark or last layer, the outer bark having been thrown off by the cork.

The suberous layer showed numerous small warts, more or less confluent laterally, so as to form elevated patches, but mainly uniting in the direction of the axis to short, very irregular, longitudinal ridges. The cork was very soft, almost mealy, of a light brownish-grey colour externally, and of a decided pale orange rust-brown within. The surface layer being easily rubbed off, the orange tinted patches were easily explained; their colour, however, is never of the bright orange-red of the patches upon the strychnos bark. The inner bark consisted of a dark brown parenchyma, in which coarse, light coloured bast fibres were imbedded in interrupted tangential rows. The inner surface of the bark was of a blackish brown colour, very coarsely striated from the rather distant bast fibres, and often with patches of a soft wood closely adhering, which in some specimens had an almost copper-green tint. The bark broke readily with a short but very distinct fibrous fracture, while the corky layer broke much smoother, the bast fibres enclosed by it not protruding from the fracture to the same extent as those of the inner bark. The taste was purely bitter, and devoid of aromatic properties.

It will be observed that this false angustura bark differs very materially from both the true angustura and the strychnos bark. The former one of these two barks occurs in curved pieces, with a pale, almost ochre coloured cork, which is very friable, and marked with suberous warts or by mainly longitudinal furrows. The inner surface is of a light brown-yellow, rather granular, not striate. The bark is very fragile, and shows a smooth fracture in which are numerous white shining striæ of crystals.

Strychnos bark is covered with a warty, light greyish, or yellowish friable cork, with frequently very large orange-red patches; fracture nearly smooth, dark brown, divided by a lighter coloured line into two layers; crystalline striæ absent; inner surface even, grey-brown to blackish brown, and finely striate.

Ricinus Communis. Analysis of the Leaves of the Plant. E. S. Wayne. (*Amer. Journ. Pharm.*, 4th series, iii., 97.)

The author, having observed a crystalline deposit in the fluid extract of the leaves of *Ricinus communis*, made an analysis of that deposit, and subsequently extended his researches to the leaves of the plant.

The crystalline deposit mentioned had the appearance of a mass

of colourless prismatic crystals, imbedded, more or less, in a mass of chlorophyll, which had also separated from the fluid extract. A portion of the deposit was removed for examination, and was treated with alcohol; the crystals were left undissolved. Water was then tried as a solvent, in which they dissolved, and the solution upon concentrating deposited long prismatic crystals, which were found, upon examination, to be nitrate of potassium.

In making a quantity of the fluid extract, and filtering the same to separate a quantity of chlorophyll deposited, the author noticed that the greenish mass on the filter was glistening with crystals, and upon treating some with water, he obtained from it a large quantity of nitrate of potassium. The presence of it in this mass was evidence that the salt existed as such in the leaves of the plant, which was also shown to be the case during the combustion of leaves and stems, they burning with scintillation and decrepitation, almost like nitre paper.

The leaves were now submitted to a careful examination for the presence of a proximate principle. The analysis of the leaves failed to show the presence of any substance having the properties of an alkaloid, but proved that they did contain a proximate principle, crystallizing in square prisms and tables.

This substance was obtained by the following process: The powdered leaves were exhausted by percolation with dilute alcohol, and the percolate evaporated in a water-bath to expel the alcohol and separate chlorophyll and resin; these were separated by filtering. The filtrate was of a dark brown colour. To it was added moist hydrated oxide of lead, and the mixture repeatedly shaken during the day; by this treatment the tannic acid present and a large portion of the colouring matter was removed. The solution filtered from the oxide of lead was of a pale amber colour; this was then evaporated to a syrupy consistence. About one ounce of extract was left, which was exhausted with eight ounces of alcohol, and the alcoholic solution set aside for spontaneous evaporation. As the alcohol evaporated, a crystalline substance commenced to form, and from the extract above mentioned, from one pound avoirdupois of the leaves, about 60 grains of the substance was obtained, of a pale yellow colour, which was dissolved in alcohol, and the solution treated with purified animal charcoal. The solution left to spontaneous evaporation deposited the substance in colourless crystals, prismatic and tabular in form.

The portion of the extract insoluble in alcohol was tested for glucose, but none found present.

The crystalline substance was then submitted to the following tests:

Concent. sulphuric acid: No change cold or by heating; by heat it dissolved to a colourless solution, which, upon being diluted with water, deposited it again as a white pulverulent mass.

Nitric acid: No change.

Hydrochloric acid: No change.

Sulphuric acid and bichromate of potassium: After standing some time a green colour.

The hydrochloric acid solution, upon the addition of solution of chloride of mercury, formed a white precipitate.

Heated with potash, ammonia was given off.

Heated upon platina foil it fuses, and upon further heating it ignites and burns with a sooty flame.

Heated in a glass tube, it fuses, volatilizes, and condenses in a crystalline form in the cool portion of the tube.

The fused mass, upon cooling, forms a mass having a radiated crystalline appearance. It is soluble in alcohol and water.

Taste bitter, resembling that of wild cherry bark when chewed.

From the above behaviour with reagents and its crystalline form, it is evident that the substance obtained from the leaves is identical with that obtained by Prof. Tuson from castor seeds, and named by him ricinin.

From experiments made with the substance from the leaves, it is evident that it has no claims to be called an alkaloid, as it has no action on litmus paper, and solution of iodohydrargyrate of potassium gives no precipitate with it. Yet it contains nitrogen, as proven by the production of ammonia when heated with potash.

All of the tests made with the substance from the leaves compare with those of ricinin from seeds.

The analysis of the plant is an interesting one, showing that a peculiar proximate principle exists in all parts of it, the same as found in the seeds. Also that the leaves contain a large percentage of nitrate of potassium, and in this respect equal to that of tobacco.

An analysis of the ash of the leaves shows that they are very rich, both in alkalies and phosphoric acid.

500 grains of the leaves were incinerated, which required some manipulation, as the ash was found to be readily fusible, and perfect combustion consequently impossible; but by charring the mass only, and then dissolving out the soluble portion with water, combustion

was accomplished. 120 grains of ash = 24 per cent., was obtained, the analysis of which gave the following results :—

Lime	33.40
Magnesia	6.20
Potash	27.15
Soda	2.13
Peroxide of Iron . . . . .	.70
Phosphoric Acid	6.68
Sulphuric Acid	2.90
Chlorine	1.63
Carbonic Acid	16.20
Silica and Sand	2.41
Loss61
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	100.00

From the above, when the size of the plant, its luxuriant growth, etc., are taken into consideration, the culture of it must be a very exhausting one upon the soil, the fertility of which must be rapidly decreased by the drain of potash and phosphoric acid. After the seed has been gathered, the stalks and leaves should be restored to the soil, and impart to it their potash and phosphoric acid, or they should be burnt, and the ash scattered broadcast upon the land from which the plants have been taken.

Rheum Officinale. Prof. Baillon. (*Pharm. Journ.*, 3rd series, iv., 690; from *L'Union Pharmaceutique*, xv., 21.) The following information respecting the new species of *Rheum*, which is now considered the true origin of the officinal rhubarb, has been supplied by Prof. Baillon to M. Regnaud for insertion in a new edition of Soubeiran's *Traité de Pharmacie*.

“Besides the *Rheum rhaponticum*, which yields the rhapontic rhubarb, Linnæus recognized four species of the genus *Rheum*, to which have successively been referred the origin of the true rhubarbs of China and Russia. These were the *Rheum rhubarbarum* (afterwards named *R. undulatum* by Linnæus himself), *R. compactum*, *R. palmatum*, and *R. ribes*. The latter, to which has been attributed the origin of Persian rhubarb, or rather of the products which are received through Persia, has never been more than a culinary herb. As to the three other species, they have all contributed (from the root) certain European and native rhubarbs.

“A species, more recently discovered in India, *R. emodi*, or *R. australe*, has, like the preceding, been considered to yield the Chinese and Russian rhubarbs; but it would appear that it only produces a kind peculiar to India.

“As to the true plant, a native of Thibet, which furnishes to commerce both the Russian and Chinese rhubarbs, it has only been known since 1867, in which year M. Darbry de Theirsant, consul-general of France at Shanghai, procured from Thibet some stalks of the species which yields this valuable drug, and which, cultivated in the garden of the faculty of Medicine at Paris and in the Vallée de Montmorency by M. Girandean, have received from M. H. Baillon the name *Rheum officinale*. It is a very large species, exceeding the height of a man, and remarkable for the considerable development of its inflorescence. The flowers are whitish, having a very deeply concave receptacle, with a marked perigynic insertion of the stamens, which in other respects resemble those of all the genus *Rheum*. The gynæcium is inserted profoundly in the most depressed portion of the receptacular cavity, and the edges of this cavity are furnished with well-developed unequal glands, of a beautiful green colour at their summit. The leaves of this species answer perfectly to the indications formerly given by Bokharian and Chinese merchants to Pallas and others concerning the true officinal rhubarb plant, namely, that the leaves have a limb of delicate green colour, in shape like an open fan, and also as analogous as possible to that of the leaves of the *Ricinus communis*. It is by this that the species is especially distinguished from *R. palmatum*, to which more than any other the origin of this medicament has been referred in recent times, upon the authority of Guibourt. But the leaves of the latter are whitish, unequally trilobed, and more or less pointed at the top. The *R. officinale*, however, belongs to the same botanical section as *R. palmatum*, as well as *R. hybridum* and *R. dentatum*, which are different plants, but have the same nervation. Here the nerves diverge at starting from the base of the limb; they are then palmate, and the two lateral nerves are destitute on the outside, for a certain distance from their base, of all parenchyma. Above this point the base of the parenchyma forms a kind of auricle, which renders the limb markedly cordate at the base. The dimensions of the limb extend to nearly a metre in each direction; it is, however, a little broader than it is long, and the petiole is about the same length. In the plants that have been raised, some leaves have been noticed which were more than a metre and a half long. Their edges are unequally divided into triangular lobes a little unequal among themselves, and the nerves ramified and prominent beneath, are in this species, together with all the surface of the parenchyma, entirely covered with a fine white down. When the plant becomes fully developed it has scarcely any roots, for these are gradually destroyed; and the

plant draws its nourishment from the soil only by small adventitious roots which could not be employed as medicine. But contrary to the other species enumerated, and of which the root can be prepared and employed, this develops above ground a stem and cylindro-conical branches, 20 or 30 centimetres high, and of the thickness of an arm or leg. These are the only portions which, cleansed from the so-called bark, divided transversely and longitudinally, and properly dried and prepared, can be used in medicine. They bear leaves, and after the fall of these, there remains on the surface only the brown, dried base of the petioles, together with the remains of the ochrea; these vestiges together constitute the pretended bark.

"In the axil of the aërial leaves there is necessarily a bud. These acquire frequently a considerable development, and are elongated into leafy branches; such is the cause of the ramification of the aërial portions of this plant. Each of these buds, detached at a suitable season, will in its turn easily take root from its base, and may thus be used to multiply the plant. Since each of these buds sends off a collection of cellular, fibrous and vascular elements, which it directs obliquely across the true fleshy, spongy bark, towards the ligneous axis of the branches, the presence in the true Thibet rhubarb of the stellate spots which are seen in sections, answers precisely to the morphological nature of the portion employed as a medicament."

N-Gai Camphor. D. Hanbury and Sidney Plowman. (*Pharm. Journ.*, 3rd series, iv., 709-712.)

Attention was first drawn to this peculiar kind of camphor by M. Rondot, who states in his work on Chinese commerce that it is extracted from the leaves of a variety of *Artemisia* known in China under the name of N-gai, and that it occurs in very white clear brittle crystals with a shining fracture.

Mr. Hanbury, who received specimens of this camphor together with a small branch of the plant from which it is made, from Mr. F. H. Ewer, of the Imperial Maritime Customs, of Canton, found that the plant was no species of *Artemisia*, though belonging to the same order. It proved to be *Blumea Balsamifera*, D.C., a tall coarse-looking herbaceous plant of Eastern Africa, an abundant weed in Assam and Burmah, and common throughout the Indian islands. It is well known to emit when bruised a strong odour of camphor, and in Burmah a crude camphor is even extracted from it. It is probable that the *Blumea* is not the only source of N-gai camphor; for according to Mr. Ewer, the name N-gai is applied to designate several plants including both Labiatæ and Compositæ. This cam-

phor is used not only in medicine but also in the manufacture of the scented kinds of Chinese ink. M. Ewer states that about 15,000 dollars' worth is annually exported from Canton to Shanghai and Ningpo, and thence to the ink factories of Wei-chan and other places.

The specimens received by Mr. Hanbury represent two forms of the camphor, the one a perfectly colourless, crystalline body, in flattish pieces about an inch in length, of the odour of ordinary camphor; the other a dirty white crystalline powder, mixed with fragments of vegetable tissue, and having an odour like that of wormwood. The latter is considered by Mr. Ewer as the crude state of the drug. Both are heavier than water, and thus resemble the camphor of *Dryobalanops*.

The chemical investigation of this camphor had been undertaken by Mr. Sydney Plowman. He found that the crystals of N-gai and Borneo camphor were almost identical, but these were very distinct from those of laurel camphor. A similar correspondence was found as regards the tension of vapour of the various kinds. The mean of two sets of experiments showed the following proportions:—Laurel camphor occasioned the depression of the mercurial column 4.5 millimetres; N-gai camphor 2.8 millimetres; and Borneo camphor 2 millimetres. The specific gravity of laurel camphor was found to be .995; that of N-gai camphor, 1.02; and of Borneo, 1.011.

The melting point (or rather, the mean of the melting and solidifying points) of laurel camphor was 177° C., of N-gai camphor 204° C., and of Borneo camphor 206° C.

Laurel camphor, exposed to a stream of washed but not dried gaseous hydrochloric acid, at the ordinary pressure and temperature, absorbed it rapidly, and in a few minutes became a colourless, perfectly transparent liquid. N-gai camphor under the same conditions absorbed the gas extremely slowly, and though kept in a constant current for several hours, did not absorb sufficient to become fluid, but still remained in fragments, though surrounded by a small quantity of a colourless liquid. It seemed after the lapse of some time to cease to absorb more gas, for no further apparent effect was observed after a certain point was reached. Borneo camphor when treated in a like manner behaved in every respect similarly to N-gai camphor.

Gaseous hydrochloric acid, dried by passing it through strong sulphuric acid, when passed over laurel camphor, quickly converted it, as before, into a colourless liquid. The N-gai camphor was affected by the dried gas as by the moist, but somewhat more

slowly, while the Borneo was not visibly acted upon at all, even after exposure to the stream of dried gas for many hours; but on removing it, it was found that the grains adhered together, showing that some slight absorption had taken place.

Berthelot and Pélouze each state that Borneo camphor, when left in contact with moderately concentrated nitric acid, is converted into a floating oil, which, when added to water, deposits a body identical with laurel camphor. N-gai camphor, when left in contact with nitric acid of a specific gravity of 1.42 for an hour, was found to be changed into a yellowish floating oil with the evolution of dense, ruddy fumes. This oil, when separated and added to water, with constant stirring, gave a deposit possessing exactly the odour of laurel camphor, and this deposit, when collected, washed, and dried by exposure in a bell jar over sulphuric acid was quickly converted into a liquid by passing a stream of dried hydrochloric acid gas over it. It was impossible to perform any more experiments in this direction upon it, since the whole of the N-gai camphor at disposal was so extremely small that scarcely sufficient for this experiment could be used without giving up some equally important operations. It would, however, have been very interesting to obtain sufficient of this deposit to make an ultimate analysis of it, so as to determine whether it has the same composition as laurel camphor.

Laurel camphor, when treated in a similar manner with nitric acid, yielded an oil floating on the acid, without, or with very slight, evolution of nitrous fumes. This oil, when separated and added to water, yielded a deposit having a terebinthinate as well as a camphoraceous odour.

After describing elaborate experiments which had been carried out to ascertain the chemical composition of the specimen, the difficulties of which were much increased by the very small quantity (about half an ounce) available, Mr. Plowman concluded that N-gai camphor is isomeric with Borneo camphor; that is to say, it possesses the same elements in the same centesimal proportions, the same number of atoms in the molecule, and, as far as can be determined, the same chemical constitution, but differs in physical properties, viz., its much higher volatility, its perceptibly different odour, and somewhat greater hardness and brittleness. It has been omitted to mention that N-gai camphor has an odour closely approximating that of laurel camphor, but much less powerful, while Borneo camphor, in addition to its weak camphoraceous odour, has a disagreeable peppery one also.

N-gai camphor may, therefore, like Borneo, be looked upon as a monatomic alcohol of the series $C_n H_{2n-3} H O$, viz., $C_{10} H_{17} H O$, the aldehyd of which is laurel camphor, $C_{10} H_{16} O$.

Jaborandi. (*Pilocarpus Pinnatus*.) Dr. S. Coutinho and Dr. Gubler. (*Répert. de Pharm.*, ii., 171.)

This new Brazilian drug has lately been brought under the notice of the profession as a powerful diaphoretic and sialogogue, by Dr. S. Coutinho, of Pernambuco, who induced Professor Gubler to make a series of experiments with this substance at the Hospital Beaujon, Paris. The results of these experiments fully corroborate Dr. Coutinho's account of the virtues of this marvellous medicine, which no doubt will soon take a prominent place in European pharmacy.

The plant known in Brazil by the name of *jaborandi*, is a small shrub, growing in the interior of some of the northern provinces of that country. The leaves, which bear resemblance to those of the laurel, are sometimes more than three decimetres long, unequally pinnate, and consist in many instances of eight or ten leaflets about 10 to 12 centimetres long, and 3 to 4 centimetres broad. These leaflets are nearly opposite, oval, elongated or ellipsoid, sometimes incurved laterally, obtuse or even retuse at the apex, and slightly unequal at the base. They are glabrous, shining, thick, brittle if dry, shortly petiolate or almost sessile. The petiolules are cylindrical, and slightly thickened at the point of insertion on the common petiole. The rachis is slightly enlarged at its base, narrow, rounded underneath, and slightly channelled above. In the absence of floral organs and fruits, it would have been impossible to determine the genus to which the plant belonged, had not Professor Baillon, by comparing it with some specimens of Brazilian plants in his herbarium, been able to identify it with a species of the Rutaceous family, *Pilocarpus pinnatus*, indigenous to the province of St. Paul, in Brazil. The names of "*jaborandi*, *iaborandi*, *jamborandi*," are simply generic terms used in Brazil for plants which are stimulants, sudorifics, sialogogues, and consequently alexipharmics and alexiterics.

The leaves of the *jaborandi* have no scent under ordinary circumstances, but if gently rubbed between one's fingers, they have an aromatic odour. The taste is slightly acrid, but without bitterness, and does not, as far as the author knows, resemble that of any plant used in medicine.

In order to use this drug, it is only necessary to bruise the leaves and the small twigs, and to make an infusion of about 4 to 6 grams

in a cup of hot water. Ten minutes after taking this and retiring to bed, the patient is covered with perspiration, which continues for four or five hours so strongly as to necessitate several changes of linen. An abundant salivary and bronchial secretion also takes place, so that the patient can hardly speak without his mouth being filled with water. The quantity excreted is sometimes a litre or more.

All therapeutists agree that the effects of sudorifics are due principally to the action of heat, whereas *jaborandi* acts by its own inherent properties, and is, even if taken cold, a powerful diaphoretic.

Dr. Gubler, besides the description of the leaves given at the beginning of this abstract, adds several statements to supplement Dr. Coutinho's paper. He says that heat has hardly any effect in promoting the perspiration when *jaborandi* is taken cold, and that the sudorific properties of this plant show themselves quite as well without its agency. Sometimes the bronchial secretion is accompanied by diarrhoea. The new drug will in all probability become of much service to medicine, as it can be used with great advantage in many cases which require the secretory action of the skin and salivary glands, such as bronchitis, diabetes, dropsy, and various other ailments.

Both Dr. Coutinho and Dr. Gubler have tried it in many of these cases, and found it fully to answer their expectations.

Dr. Rabuteau has submitted some leaves of *jaborandi* to a chemical and physiological investigation. The following is a summary of his reports published in *L'Union Pharmaceutique* (vol. xv., p. 120):—

Fourteen grams of the coarsely-powdered leaves were distilled with 200 grams of water until about one third had passed over. The colourless and slightly turbid distillate had the odour of the leaves and a slight peppery taste. It gave no precipitate with phospho-molybdic acid, nor with iodide of mercury and potassium, which leads to the conclusions that the odour of the leaves is caused by a volatile principle, and that no volatile alkaloid is present in the distillate.

The contents of the still were strained and filtered, and the filtrate examined according to Stas' method, but no alkaloid could be discovered.

The aqueous decoction of the leaves had a bitter taste; and on evaporation left a brown residue, which yielded its bitter principle to alcohol.

Dr. Rabuteau had now but eleven leaves, weighing 2.9 grams, left for conducting his physiological experiments. He made a cupful of an infusion of the powdered leaves, which he took at ten p.m. Perspiration soon ensued, and was followed by copious salivation, which lasted nearly two hours, during which the thermometer showed but a slight increase in the temperature of the body.

Jervia in *Veratrum Viride*. Chas. L. Mitchell. (*Amer. Journ. Pharm.*, vol. iv., No. iii., 101.)

Some ten or fifteen years ago jervia was obtained from *Veratrum album*; but notwithstanding the fact that *Veratrum viride* is so similar in almost every respect, no record has as yet been found of any attempt having been made to prove the presence of jervia in the latter root.

While recently preparing specimens of the *Veratrum viride* alkaloids, according to the process given by Mr. Bullock, the author's attention was drawn to the circumstance that, when the precipitate produced in the acetic solution by sodium carbonate was treated with warm diluted sulphuric acid, a considerable amount of a granular, whitish powder separated on cooling. He at first supposed it was sulphate of calcium, but a closer examination revealed the fact that it was of organic composition; and after several different trials he succeeded in proving it to be an alkaloid identical with the jervia obtained by Simon from the *Veratrum album*. It may be obtained in its pure form by the following process:—

Veratrum viride finely powdered is thoroughly exhausted with stronger alcohol, the tincture evaporated to a small bulk, acidulated with acetic acid, and precipitated in water. The resin is then separated by filtration from the aqueous solution of the alkaloids, and the filtrate concentrated by evaporation, and rendered strongly alkaline with solution of carbonate of sodium. The precipitate thus obtained is drained, dried, boiled with strong alcohol until nothing more is taken up, the alcoholic solution evaporated to dryness, and digested in very dilute sulphuric acid.

The granular powder which deposits on cooling is sulphate of jervia. This is separated, well washed and drained, and then boiled for some time with a strong solution of carbonate of sodium. By this treatment the sulphate of jervia at first formed is decomposed, the jervia separating as a granular powder, which is washed until free from alkali, dissolved in acetic acid, precipitated with ammonia, well washed, and dried.

Jervia thus obtained is a light, white powder, capable of crystal-

lizing from an alcoholic solution, tasteless, inodorous, and of a feebly alkaline reaction. It is insoluble in water, but very soluble in boiling alcohol, from which it is almost entirely deposited, on cooling, in white flakes. It is freely soluble in chloroform, but is only slightly soluble in benzin. With acetic and phosphoric acids it forms very soluble salts; with sulphuric, hydrochloric and nitric acids it yields salts, sparingly soluble in alcohol and water, and precipitated from the more soluble acetate and phosphate.

Potassa, soda, and ammonia precipitate jervia from its solutions in white, rather gelatinous flakes, insoluble in an excess of the precipitant. With reagents it gives the following reactions: perchloride of gold, curdy yellow precipitate; sulphocyanide of potassium, white precipitate; bichloride of platinum, granular yellow precipitate; iodohydrargyrate of potassium, curdy white precipitate.

The most characteristic test for jervia is its reaction with sulphuric acid. When a minute fragment of it is moistened on a glass slide with a drop of concentrated sulphuric acid it immediately changes, first to a straw yellow, and then gradually to a green colour. This reaction is quite delicate.

Concentrated nitric and hydrochloric acids dissolve jervia to a colourless solution, which when boiled becomes of a straw colour; when heated it melts to a clear oil; at a little above 400° Fahrenheit it turns brown; and when the temperature is raised still higher, it burns with a smoky flame.

Thinking that it would be well to compare this alkaloid with the jervia from *Veratrum album*, the author subjected some of the latter, which he had previously prepared, to the same tests, with precisely the same results. He cannot as yet state exactly the proportion in which jervia exists in *Veratrum viride*, but he is pursuing a series of investigations on both this and *Veratrum album*, the results of which he trusts shortly to be able to make public.

Buchu Leaves. F. A. Flückiger. (*Pharm. Journ.*, 3rd series, iv., 689; from *Schweiz. Wochenschr.*, 1873, No. 51; also *Repertor. der Pharm.*, xxiii., 2, 102.)

The leaves of species of *Barosma* growing at the Cape, known under the name of buchu leaves, are but little used, and have not yet been the objects of a chemical or a microscopical investigation, although worthy in a high degree of both. The smell of buchu leaves appears to the author not to depend alone upon the essential oil, for in this respect it is more suggestive of peppermint. By long exposure to the cold of winter, he has obtained from the oil a well-

crystallized camphor which melts at 85° C., and commences to sublime at 110° C. It dissolves in bisulphide of carbon, from which it may be obtained in fine needles that might well be taken for peppermint stearoptine. The elemental analysis gave, carbon 74.08, and hydrogen 9 to 10; but it was not sufficiently satisfactory to construct a formula from. The oil poured off from the camphor of *Barosma betulina* does not boil under 200° C., and after being rectified over soda, answers to the formula $C_{10}H_{16}O$. The crude oil turns the plane of polarization to the left.

The aqueous infusion of the leaves contains some mucilage, and a body which belongs probably to the quercitrin or rutin class; the extract is not altered by ferrous salts; it is coloured greenish brown by ferric chloride, and gives with acetate of copper, a yellow precipitate which is soluble in potash. Further experiments are required to show what this body is.

In an anatomical point of view buchu leaves appear at first sight remarkable by the large spherical oil vessels, which however do not claim any especial interest. If a transverse section of a *Barosma betulina* leaf be made, three layers can be discerned in the inner tissue. The thickest, occupying the middle of the leaf, is coloured green by chlorophyll, which is much less the case with the considerably smaller layer occupying the space between the chlorophyll layer and the under side of the leaf. A third layer, in a section prepared in alcohol or oil, is scarcely perceptible. It appears as a small uncoloured zone directly under the epidermis of the upper side of the leaf, in which, differing from the under side, no oil vessels appear. There may be seen also the fibrovascular tissue, the raphides, the cuticle, and the epidermis constituting the skin tissue of the leaf.

If a section of *Barosma* leaf be placed in glycerin, the epidermis of the upper side is raised by a mechanical action which resembles that which takes place when the epidermis of linseed, white mustard seed, quince seed, etc., is saturated with water. The delicate walls of the colourless cells in the last mentioned layer swell up, and protruding perpendicularly to the surface of the leaf, let a thick slime run out, in which the cell walls gradually disappear. At first there seems to be in this cellular slime an appearance of delicate stratification as in many other similar cases. The mucilage is not coloured by iodine, consequently it may be considered to approach nearer to cellulose. Under the influence of glycerin the mucilaginous layer of the leaves of *Barosma betulina* assumes the development described quite gradually; but it is

produced much more quickly when the leaves are placed under water. In the latter case this layer occupies fully half the breadth of the section.

The leaves of the *Barosma crenulata* and *B. serratifolia*, are, as is known, much thinner, being about half as thick as those of *B. betulina*. When these thinner leaves are placed in alcohol the mucilaginous layer remains scarcely perceptible, but in water it swells equally with that of the other kind. The breadth of the layer is then proportionately much more considerable in the thinner species, taking up two thirds the breadth of the section of a leaf.

Whilst we are accustomed to find the epidermis to be the seat of the mucilaginous formation in seeds, and to meet with special mucilage cells in the cortex, in the buchu leaf this function belongs to a row of cells (collenchyma) in the interior, without the epidermis having any share in it, if we, at least, leave out of consideration the fact that here and there isolated prolongations of cells extend from the epidermis into the mucilaginous layer.

The author does not know whether other leaves present similar conditions: in *Althæa* leaves, after quite a cursory examination, this appeared to him to be no more the case than in those of *Sesamum indicum*, which are tolerably mucilaginous. *Empleurum serrulatum*, on the other hand, resembles *Barosma*.

The Culture of Gunjah in Bengal. (*Journ. of Applied Science*, Feb. 1, 1874.) Ganja or gunjah (*Cannabis indica*) forms an important excisable article in Bengal, and yields a yearly revenue of about Rs. 1,107,000 (£110,700). Why the cultivation of ganja is confined to a single tract of land lying on the north of Rajshahye, south of Dinagapore, and south-west of Bogra, is a vexed question. Judging of matters from a practical point of view, similar soils would produce ganja anywhere. Every year the cultivation is extending to the north and east, which is an indication that it is not confined to a limited space. The mode of cultivation, the labour and outlay necessary, the restriction placed on storage and sale of ganja, the rapidity with which it deteriorates—operate as a check to a successful extension of the cultivation in every district. Ganja is also grown in the tributary mehals of Orissa, but it is of an inferior description, and finds no favour with the smokers in Bengal. All soils are not equally adapted to the cultivation of ganja. Light sandy soils are best adapted, and the plants reach the height of six to seven feet. Poor warm soils sometimes yield good hemp; stiff clays are generally avoided. Extreme moisture is prejudicial to the

growth of the plants. The cultivation begins in August; the seeds are sown broadcast in the nursery, and in a week they germinate. In a fortnight when the plants attain a little strength, and are able to bear transplantation, the nursery is broken, and the seedlings are sent to the field, and sown in rows six inches apart from each other. The fields are not large in size, each being on an average fifteen cottahs, or a beegah. The soil is renovated every year by the addition of fresh earth, and before the seedlings are transplanted, the ground is harrowed, and manured with oil-cakes and cow-dung, and the soil thus prepared is fit to receive the plants. When the plants spread their leaves, men, known as "ganja doctors," are employed to pick out the female plants, which yield no flowers, and are injurious to the crop. Ganja doctors alone can distinguish the female organs in the plants; the process of picking is repeated two or three times, and when the cultivator is sure that all female plants have been uprooted and thrown away, he again manures the ground with cow-dung and liquid oil-cakes, and clears the stems of the plant. In a field of one thousand plants, some four hundred are thrown away. In December, when the plants reach the height of four or five feet, ridges are opened, and the ground is irrigated and manured with oil-cakes. The more oil-cakes are used the more the plants thrive. At the end of January the plants mature, and the harvest season commences. The plants are cut by the cultivators and divided into four or five parts, and exposed to the rays of the sun for three or four days; the leaves being withered, are spread on mats, and trampled upon, and they assume the flat shape in which ganja is sold in the market. Round ganja is prepared by a similar process; the stalks being taken off, each branch is rolled up and dried. Chur ganja consists of flowers and leaves. There is no difference in the narcotic powers of these three descriptions of ganja. The natives of the Turkish empire and the north of Africa are far more addicted to the use of haschisch, or hemp, than to that of opium. They have a similar effect, yet the former is decidedly preferred. They use either the dried leaves in smoking, or they drink the expressed juice, or use it in the form of cakes soaked with that essence. Much uncertainty prevails among botanists regarding the plant or plants which produce these narcotics—whether they are different species or mere varieties of the common hemp. Probably *C. sativa* and *C. indica* are identical, yielding the ganja and bhang of the East. Both the above drugs are sold separate in the Indian bazaars, and in external appearance are considerably different. Ganja has a strong aromatic and heavy odour, abounds in resin, and is sold in the form

of flowering stalks for smoking with tobacco. It is made up in bundles about two feet long and three inches in diameter, containing about twenty-four plants. Bhang is in the form of dried leaves without stalk, of a dull green colour, not much odour, and only slightly resinous. Bhang is not smoked, but pounded up with water into a pulp, so as to make a drink highly conducive to health, and people accustomed to it seldom get sick. Bhang grows in abundance in Tirhoot and Bhagulpoor in the wild state. In Scinde a stimulating infusion made from the plant is much drunk among the upper classes, who imagine it to be an improver of the appetite. Ganja is frequently mixed with tobacco to make it more intoxicating. This is especially done by the Hottentots, who chop the hemp leaves very fine, and smoke them together in this manner. Sometimes the leaves powdered are mixed with aromatics, and thus taken as a beverage, producing much the same effects as opium, only more agreeable.

The cost of cultivating one beegah of land is about 36 rupees; about one half of this being expended in irrigation and manure, without which ganja does not thrive. There are no irrigation wells in this district, and the water required is baled from the nearest tank, bil, khal, and river. The cultivators fully understand the advantages of allowing land to remain fallow for a year or two, and alternate the ganja sometimes with barley, mustard, or other pulses. Ganja is grown on high lands, as extreme moisture injures the plants. Each cultivator cultivates one cottah to four beegahs of land; the produce varies from 5 maunds 20 seers to 9 maunds 20 seers per beegah. About 1000 to 1200 beegahs of land are annually sown with ganja, and the produce amounts to from 9000 to 10,000 maunds; 1300 to 1400 men are engaged in the cultivation. Ganja is one of the first staple articles of produce in this district, and the value of export may be estimated at 200,000 rupees. Thirty years ago, the value of this export was estimated at 40,000 rupees, the drug was sold by the cultivators at 8 annas to 1 rupee 4 annas a maund, and now the price has enormously increased. The general rise in the price of all articles of food also influenced the ganja trade. From 4800 to 5100 licences are annually issued for the sale of this drug in Bengal. The cultivators of ganja are mostly Mahomedans, because the bulk of the population in the northern parts of this district is of that persuasion. The hooka is in general use, and both sexes smoke. Children at an early age acquire the habit of smoking the hooka; at an early hour of morning the men leave the house with a hooka in hand to work in the field. The use of

stimulants is unknown to the ryots on the north of this district. Of late they have acquired the habit of chewing opium; ganja, which is extensively cultivated by them, finds no favour. The ganja trade is carried on by three distinct classes of men: the cultivators who produce the drug, the wholesale dealer who exports it from the producing district, and stores it in a public gola to sell to the retail vendors, and the retail vendors who supply the consumers. Each in his turn makes what profit he can. Neither the first nor the second has any fee to pay to Government. The cultivators sell the drug to the wholesale goladar and retail vendor, and to nobody else, and any violation of this condition subjects him to a penalty and a forfeiture of his licence. He makes his bargain without the intervention of excise officers. He submits his samples to the purchaser through a broker, and if it is approved, the bargain is struck, and the drug is conveyed to the cutchery of the supervisor of the cultivation of ganja to have it passed. The wholesale goladar sells the drug to the retail vendor in the presence of excise officers. The retail vendor pays a monthly fee of four rupees for each licence and the duty fixed by the Board of Revenue. This fee in the town of Calcutta and its suburbs is fixed at sixteen rupees in Calcutta, and at eight rupees and four rupees in the suburbs respectively. The wholesale trade is confined to two hundred people, and they are all men of substance. The retail vendors are men of small capital, averse to agricultural labour. They are generally illiterate, and cannot even write the accounts of their shops. They manage to make a capital living. The whole of the excise duty on ganja is contributed by the labouring classes. There has not been any improvement in the cultivation of ganja. The same process for conserving the manure is followed. There has evidently been deterioration in quality of the produce; the plants do not weigh as heavy as they did twenty years ago.

Adulteration of Ginger. T. Garside. (*Pharm. Journ.*, 3rd series, iv., 831.) The writer draws attention to the frequent occurrence of a chalky powder on the so-called bleached ginger. He examined five samples obtained from different shops, and found sulphate of calcium on two, and carbonate of calcium, with small quantities of sulphate and chloride, on the three remaining samples. The adhering mineral matter from one of the pieces amounted to 2·33 per cent., and was found to consist of

	Per cent.
Calcium chloride	4·98
Calcium sulphate with other salts	7·90
Calcium carbonate	87·12

The small proportion of chloride seems to show that the chloride of lime process had not been employed. Moreover, on two out of the three samples containing calcium carbonate, small particles of ultramarine were detected; and this, under the name of lime blue, is commonly used to improve the colour of lime washes.

It would appear from these facts that three of the samples had not been bleached at all, but were simply white-washed. As to the two other samples, the case is rather more doubtful, as the ginger may have been steeped in solution of chlorinated lime, and afterwards exposed to sulphurous acid fumes; calcium sulphite might thus be formed, which, on exposure to air, would become converted into sulphate.

Ailanthus Glandulosa, a Remedy for Dysentery. (*Pharm. Journ.*, 3rd series, iv., 890; from *Repert. de Pharm.*, ii., 237). In a recent issue of the *Archives de Médecine Navale* is published an official note, addressed by Dr. Robert, who is the medical chief of the naval division of China and Japan, to the Inspector-general of the Health Service in the French navy, calling attention to a drug used by Chinese physicians in the treatment of dysentery. It consists of the root bark of the *Ailanthus glandulosa*, Desf., a plant belonging to the natural order Simarubaceæ, very common in the North of China and less so in Japan. It is also frequently cultivated in France and Italy for the purposes of shade, whilst its leaves have been used as food for silkworms.

The bark of the root is the only part employed. It is white when fresh, resembling mallow root, but it acquires a greyish tint in drying. It is fibrous and loose in texture, and is almost without smell. An infusion of this bark, however, exhales a slightly nauseous odour, and possesses an excessive bitterness, resembling that of sulphate of quinine. The Chinese physicians employ the root in the fresh state only; but Dr. Robert, having been compelled to use some that had become dry, found no sensible difference in its action in the two states.

For administration 50 grams weight of the fresh root is cut into very small pieces, and triturated with 75 grams of hot water for a few minutes in a mortar, in order to soften the bark, and then strained. A tea-spoonful of this strong infusion is administered as a dose morning and evening, alone or in a cup of tea. Taken in this form it provokes vomiting. The medicine is administered in this manner during three days, the patient being kept upon full diet. After that time the ailanthus is omitted, and the diet is altered to broths until health is restored. If after eight days' treatment the

patient is not cured, the Chinese physicians recommence the use of the *ailanthus*; but Dr. Robert states that he has not met with a single case in which this resumption has been necessary, although he has had under his notice some where the disease had lasted several months, as well as others of more recent origin.

The principal symptoms which follow the administration of the *ailanthus* are said to be nausea, and sometimes vomiting, followed by a temporary lowering of the pulse. The disappearance of blood from the evacuations commences on the first day and is complete on the second; the colic ceases a little later. The effect of the drug upon the colour of the evacuations is variable. Dr. Robert sums up by expressing his opinion that the administration of the *Ailanthus glandulosa*, as witnessed by him in China and Japan, gave superior results to that of *ipecacuanha* astringents, alone or combined with opiates or calomel. The remedy, he says, is only known to a portion of the Chinese physicians, a circumstance which he attributes to their custom of preserving the secrets of their practice.

Dr. Robert states that the root of *Ailanthus glandulosa* is not usually to be obtained in the Chinese pharmacies; but that in the dialect spoken at Shanghai it is called "hiang" or "siang-tcham;" and in the mandarin dialect spoken at Peking and Tiensin, it is named "tchau-tchoun," which latter agrees with the name attributed to it by Dr. F. Porter Smith in his "Contributions to the Materia Medica and Natural History of China," p. 6. The latter writer points out that the *Pen Ts'au'* includes *Ailanthus foetida* or *glandulosa* with *Cedrela odorata* and other trees distinguished by their odour, under the common name "chun-chu." He further remarks that "this species of *Ailanthus* grows all over China, and is met with on the walls of Peking. The leaves are used to feed silkworms, and in times of scarcity are used as a vegetable, though much less agreeable than the young leaves of the *Cedrela*. They are said to be slightly deleterious, and are used as astringent, anthelmintic, and deobstruent remedies. They are given in diseases of the lungs, dysuria, tabes infantum, menstrual disease, spermatorrhœa, and fluxes in general; and a wash is made to promote the growth of the hair, and to wash scabious eruptions and ulcers. In most of these cases the bark both of the tree and the root is used having precisely the same properties. The bark of the mangrove tree is sometimes adulterated with this inferior substitute." But he does not mention its use in dysentery.

In the non-official portion of the Pharmacopœia of India, the *Ailanthus Malabarica*, D.C., a large tree of Ceylon, Malabar, and

Concan, is mentioned as yielding an aromatic gum-resinous substance, known by the Tamul name of matti-pawl, which is used medicinally, especially in dysenteric cases, and as incense. Dr. Gibson regards it as a good stimulant in bronchitic affections. The bark is rough and very thick, with a pleasant and slightly bitter taste; it is studded with bright garnet-looking grains, apparently of a resinous nature, but not burning like resin or dissolving either in spirit or water. A specimen of the extract prepared from this bark may be seen in the Museum of the Pharmaceutical Society.

The bark of another species of *Ailanthus*, *A. excelsa* is mentioned as being used by the natives in dyspeptic complaints, and esteemed as a powerful febrifuge. This bark was the subject of an exhaustive treatise by Mr. Narayan Daji, read before the Grant College Medical Society of Bombay, in which its properties were attributed to the presence of ailanthic acid. The paper was published in the *Pharmaceutical Journal*, i., 154.

Notes on some American Drugs. John M. Maisch. (*Amer. Journ. of Pharm.*, 4th series, iii., 103.)

Cranesbill appears to be used very extensively in some sections of the country, while in others it is comparatively unknown, at least as a domestic remedy.

Geranium maculatum is said to be a cure for dysentery, diarrhœa, and all kinds of bowel complaints. It seems probable that the rhizome alone is meant, the herbaceous portion of the plant not being employed for the purposes mentioned, as it has merely a faintly bitter taste, and is almost devoid of astringency.

Antidote to Snake Poison. In August, 1873, the author received from Mr. T. B. Reed, of Meridian, Miss., the root and radical leaves of a plant, which, the letter stated, "is said to be a specific for snake-bite; and, in fact, the country people use no other antidote in cases of this description." The letter gave, however, no information whatever in regard to the part employed for the purposes stated, or to the manner in which it is used. The plants sent contained neither stem nor flowers, but from the black colour of the dried plants and the character of the leaves, were at once referred to the genus *Gerardia*, and by comparison with herbarium specimens, were recognised as *Gerardia* (*Dasystoma*, Benth.) *quercifolia*, Pursh. It belongs to the subgenus *Dasystoma*, which comprises perennial plants with rather large yellow flowers, with the leaves, particularly the lower ones, more or less pinnatifid or cut-toothed, and opposite on the stem, the floral leaves being often alternate; it is very difficult to preserve the green colour of the plants, all the

species readily turning black on drying. The genus belongs to the order Scrophulariaceæ.

The species in question resembles, and is closely allied to *gerflava*, Lin., and *integrifolia*, Gray, and is distinguished from both by the plant being smooth and glaucous, the lower leaves being usually twice pinnatifid, and by the peduncles attaining about the length of the calyx, they being shorter in the other two species named.

Most probably the subterraneous portion is the part employed. It consists of a short and rather thin upright rhizome, sending off from eight to ten rootlets, which are about six inches or more in length, nearly simple, when dry slightly furrowed longitudinally, and readily breaking transversely. The fracture is even, somewhat granular, exhibits a thick cortical portion of a dark grey colour, surrounding a thin ligneous centre, of a yellowish colour and a rather irregular shape. The root probably contains a principle analogous to saponin.

Verbena bracteosa, Mich. This plant, which grows very abundantly in Terre Haute, Ind., and also in Kentucky, is used with marked success as an infusion in the treatment of scrofulous affections, particularly in scrofulous sore eyes; and its alterative properties are said to be more potent than those of iodide of potassium.

The plant is procumbent and widely spreading, with its stems branching to the length of from 12 to 18 inches. It is covered with spreading whitish hairs; the leaves are narrowed at the base into a short petiole, broadly lanceolate in outline, deeply cut-toothed, or the lower pinnatifid, and the teeth rather acute. The small blue or purplish flowers are collected in dense spikes terminating the branches, the numerous bracts being longer than the flowers, lance-linear in shape or the lower deeply three-cleft. Its hoariness and its dense long bracted and squarrous spikes are quite characteristic of this species, which possesses a gradually developed but lasting bitterness. The plant seems to merit some attention, particularly with the view of isolating the bitter principle and determining its value as an alterative.

California Opium. The author received from Mr. J. H. Flint, of Marysville, Cal., a handsome specimen of opium, which was raised in Sutter County on the Sacramento River, about fifteen miles from that city. It yielded $7\frac{3}{4}$ per cent. of morphia, 52 per cent. of matter soluble in boiling water, and lost 17 per cent. of moisture after drying at 212° F. It was more homogeneous in texture than Smyrna opium, of a good strong narcotic odour, and unexceptional in its

physical properties. The dry opium contained about 9·34 per cent. of morphia, which is nearly the strength of the opium as directed by the Pharmacopœia.

Oregon Balsam of Fir. The author has not been able to obtain much information about this oleo-resin, except that it is a thick liquid, perfectly transparent, of a bright brownish colour, and a distinct terebinthinate and aromatic odour. On rubbing a little of it between the fingers, different odours become quite evident, the last one remaining being that of nutmegs. It has the appearance of being merely a solution of common resin in oil of turpentine, flavoured perhaps with a little of the oil of *Eucalyptus globulus* and a somewhat larger quantity of the volatile oil of nutmegs. It is obtainable in New York.

Adulterated Serpentina. When Virginia snakeroot is sold in bulk, it is sometimes adulterated with the rhizome and rootlets of *Cypripedium pubescens*, Lin. (not *C. parviflorum*). The rhizome of the Virginia snakeroot is quite thin, rarely exceeding one-tenth of an inch in diameter, the remnants of the overground stems are invariably projecting as short branches from the rhizome, which terminate by a scarcely concave scar. The rhizome of *Cypripedium* is much coarser, the skins die off to the rhizome, leaving large deeply cup-shaped scars, the older ones penetrating deeply into the rhizome. *Cypripedium*, moreover, is a monocotyledonous plant, while *Serpentaria* is dicotyledonous, and the difference in the characteristic disposition of the ligneous bundles is quite evident.

Composition of the Berries of *Berberis Vulgaris*. Dr. Graeger. (*Vierteljahrssch. f. pract. Pharm.*, xxii., 589.) The author has made an analysis of the perfectly ripe berries of *Berberis vulgaris*, and obtained results which deviate from those previously published by E. Lenssen (*Year-Book of Pharm.*, 1871, p. 24). He found in 100 parts—

Stones and Skins	15·58
Malic Acid (Hydrate)	5·92
Glucose	4·67
Gum	6·61
Ashes (from the juice)	0·06
Water	67·16

100·000

The Botanical Origin of Koegoe. E. M. Holmes. (*Pharm. Journ.*, 3rd series, iv., 810.) This drug was brought under the notice of the British Pharmaceutical Conference at the Brighton meeting in August, 1872, by Mr. Keyworth, who then stated that its botanical

source was unknown. The author, having obtained a supply of koegoeds from Mr. Keyworth, succeeded in showing it to be the root and procumbent stem of *Mesembryanthemum tortuosum*. The specimen which he examined contained a few leaves of an oblong, ovate shape, which exactly corresponded in appearance with those of the plant named, of which there is a specimen in the British Museum. Dr. Shaw, who is well acquainted with the flora of South Africa, corroborated the author's opinion, as he was able to recognise the koegoed as the form in which *M. tortuosum* is used by the Hottentots.

The koegoed, besides being used as stated by Mr. Keyworth, as a sedative for cattle, is chewed by the Hottentots as an intoxicating agent, and appears to possess narcotic properties which deserve further investigation.

A False Cascarilla Bark. E. M. Holmes. (*Pharm. Journ.*, 3rd series, iv., 810.)

The author gives the following description of a spurious cascarilla, which is now occasionally met with in commerce. The periderm, or outer layer of bark, does not readily peel off, and is of a fawn colour, not white. On the inner surface the bark is of a reddish tint, and is furnished with a number of straight, closely-packed, raised lines, which give it a striated appearance,—the inner surface of cascarilla being smooth. The taste is not aromatic but astringent, and almost without bitterness. The colour of the bark is also of a more reddish tint than that of cascarilla. From the general appearance and microscopical structure of the bark, it seems probable that it may belong to a plant of the same genus as the cascarilla.

Mr. A. H. Squire, who first brought this bark under the notice of the author, has examined its behaviour with various reagents, and finds that the infusion and tincture are darker in colour than those of cascarilla; that tincture of galls gives a scarcely perceptible cloudiness, and that tincture of perchloride of iron turns the tincture almost black, while the infusion is only slightly deepened in colour by it; and that acetate of lead gives an abundant precipitate with both tinctures. The tincture of cascarilla is not altered in appearance, either by tincture of perchloride of iron, or tincture of galls.

The author supposes this spurious cascarilla to be identical with the bark of *Croton lucidum*, L., which in the fresh state is slightly bitter and astringent, and resembles the spurious bark in the dull red colour of the cortical layers.

It is said to be used by the negroes of New Providence, to mix with the bark of the true cascarilla, under the idea that it improves

the curative powers of the latter, and it is known by the name of the false sweetwood bark, sweetwood being the name applied by them to the true cascarilla.

Spurious Arnica Roots. E. M. Holmes. (*Pharm. Journ.*, 3rd series, iv., 810.) Two samples of arnica root were submitted to the author for examination, and proved to be much adulterated. One contained fifty per cent. and the other only one per cent. of true arnica.

In both samples there were two or three different kinds of roots, but the chief adulterant in both cases was the same.

The spurious drug may be at once recognised by the fact that it is not a rhizome, but a root which evidently descends vertically into the soil, as it is surrounded on all sides by rootlets. In size it varies from that of arnica to five or six times as large, in some pieces appearing præmorse, and in others suddenly narrowed and elongated. The cortical portion resembles that of arnica in colour, but the medullium, or central portion, is of a purple tint, and presents a discoid appearance: two characters which are met with in but few roots.

When the root is soaked in water, the purplish medullium swells up, and loses its discoid appearance. The taste is astringent and somewhat aromatic, faintly resembling that of cloves. The astringent taste and the appearance and structure of the spurious arnica, left no doubt in the author's mind that it was identical with the root of *Geum urbanum*, an indigenous plant well-known to herbalists in this country. The other kinds of root were present only in small quantity, and appear to have been accidental. One is a slender rhizome of a paler colour than that of arnica, and has a white discoid medullium, and a bitter taste; another is evidently that of a species of *Vaccinium*; a third looks very like valerian, but is odorless; a fourth closely resembles bistort root.

The leaves had been carefully removed from all the spurious roots, while an unusual quantity of arnica leaves were mixed with the roots, which proves that the adulteration was an intentional one; the more so, as the leaves, stems, and flowers of the two plants are totally distinct.

Adulteration of Belladonna Root. E. M. Holmes. (*Pharm. Journ.*, 3rd series, iv., 811.) The author detected about fifty per cent. of a malvaceous root, which he believed to be that of *Malva sylvestris*, in a sample of belladonna root. Externally, the two are very much alike, especially when the belladonna is in small pieces, but internally the appearance and structure will be seen to be very different, belladonna having a very large medullium and a small cortical

portion, while in the mallow the two are nearly equal. The fracture of belladonna also is short, while in the mallow it is distinctly fibrous.

The adulteration, although easily detected, is of considerable importance, seeing that it would in this proportion reduce the strength of the preparations of belladonna by one-half. Both the arnica and belladonna were imported from Germany.

The Balsam of Liquidambar Styraciflua. William L. Harrison. (*Amer. Journ. of Pharm.*, April, 1874, 161.) This balsam, commonly known as sweet gum, is a natural exudation from *Liquidambar styraciflua*, a tree belonging to the natural order Hamamelacæ, sub-order Balsamifluæ (Gray). It is indigenous to nearly all parts of the United States, growing most abundantly in the southern portion. It seems to prefer moist localities, as swamps, the banks of rivers, etc., though it is often found in elevated situations and quite distant from water. In favourable situations and when matured it reaches the height of fifty to sixty feet, with a diameter of two to four feet.

The trunk is covered with a greyish, deeply furrowed bark, and the branches have thick corky ridges running their entire length. The leaves are palmate, deeply five to seven lobed; lobes pointed, smooth, and shining; of a bright green colour, becoming crimson in autumn.

The flowers are mostly monœcious, in globular heads or catkins; the sterile arranged in a conical cluster, naked, stamens numerous, filament short. The fertile flowers consist of many two-celled, two-beaked ovaries, subtended by minute scales in place of calyx, all more or less cohering and hardening in the fruit, forming a spherical catkin; styles two, ovules many, but only one or two perfecting.

The balsam is obtained from incisions in the bark. As it first exudes it is of a yellowish colour, and of the density of thick syrup; by standing it thickens, and after some time becomes darker in colour, and finally perfectly hard. On being broken, in the latter state, the fracture presents a variegated appearance, from a dark brown to spots of a pure white colour. It has a pleasant benzoic odour, and a balsamic and somewhat burning taste. It is soluble in alcohol, ether, chloroform, and fixed oils; its alcoholic solution slightly reddens litmus paper.

With the view of ascertaining its constituents, a specimen, collected in south-eastern Virginia, was submitted to the following treatment:—

Four ounces avoirdupois of the balsam, in a semi-liquid state, were distilled with an aqueous solution of sodium carbonate as long as any oil continued to come over. The distillate contained about half a dram of colourless oil floating on the surface of the water.

The liquid remaining in the retort was filtered from the resin, and sulphuric acid in slight excess added to decompose the cinnamate of sodium. The result was a copious deposit of a light yellowish colour. This was collected and washed on a filter till free from sulphuric acid; it was then dried and heated with hot petroleum benzin, which dissolved all except a little brown resinous matter. The benzin solution, while still hot, was decanted into another vessel, and allowed to cool. It was then found to have deposited all the acid in small, perfectly white, needle-shaped crystals.

The liquid filtered from the precipitate obtained by decomposing the first solution by sulphuric acid, appeared quite cloudy, and by tests was found still to contain some cinnamic acid. It was carefully evaporated to dryness, and the residue treated with boiling benzin, which, on being decanted and allowed to cool, deposited a small amount of a white amorphous powder. This was collected, and all the benzin having been removed by careful heating, was boiled with a small quantity of water. It was readily dissolved, the solution giving an acid reaction, and on cooling deposited quite a quantity of long, colourless, acicular crystals. These were dried and treated with hot benzin, which at once dissolved them, and on cooling deposited them in the usual shaped crystals of cinnamic acid.

As the decompositions in its amorphous condition were identical with those of crystallized cinnamic acid, and as it was converted into a crystalline state simply by dissolving in water, the amorphous substance must have been cinnamic anhydride.

The amount of impurities in the balsam (consisting of pieces of bark, dirt, etc.), was 160 grs.; this deducted from the original weight, 4 ounces avoirdupois, leaves 1590 grs. of pure balsam operated upon; the amount of acid obtained was 88 grs., making a yield of about $5\frac{1}{2}$ per cent. It was found to agree with the reactions of cinnamic acid given in Gmelin's Hand-Book of Chemistry.

The resin remaining after the extraction of the cinnamic acid was treated with boiling petroleum benzin, the liquid decanted and allowed to cool, when a yellowish white oily-looking mass was deposited. This was proved to be styracin, rendered amorphous by heat. The vessel containing it and the benzin was set aside in a moderately cool place, and allowed to stand for several weeks. On then examining it, the yellowish mass was found to have become

crystalline, and a quantity of styracin in clusters of white acicular crystals had been deposited on the sides of the vessel above the surface of the benzin. The property of being rendered amorphous by heat and recrystallizing on standing, as well as the manner of crystallizing above the surface of the liquid, are mentioned by Gmelin as characteristic of styracin. The specimen under examination also afforded the following reactions of styracin.

Treated with nitric acid it is changed into a yellowish pulverulent substance, evolving at the same time the odour of oil of bitter almonds. With sulphuric acid and bichromate of potassium it also evolves the odour of oil of bitter almonds. Treated with sulphuric acid alone, either hot or cold, it is charred. It is completely insoluble in water, either hot or cold, soluble in alcohol, and more freely in ether. It does not combine with or dissolve in solution of lime, even at boiling heat, neither does it dissolve in solution of ammonia. Heated with potassium hydrate, it is converted into cinnamate of potassium, and a brown resinous-looking substance, with a pleasant odour, resembling that of cinnamon. It does not combine with acids, but is rendered more soluble by them, *e.g.*, the solution of one part styracin in eight of boiling alcohol becomes turbid on cooling, but is immediately rendered perfectly clear by the addition of a little sulphuric acid.

The volatile oil, styrol, obtained by distillation, seems identical with that from storax. It is a hydrocarbon, nearly colourless, of a peculiar aromatic odour resembling the balsam, and has a persistent, burning taste. It is slightly soluble in water, and imparts to it, in a marked degree, its peculiar odour; very soluble in alcohol, ether, and the fixed oils. Sulphuric acid has no marked effect upon it. Treated with nitric acid it is converted into a reddish resinous-looking substance, evolving an odour almost identical with that of oil of turpentine.

The resin remaining after the cinnamic acid, styracin, and styrol had been extracted, was of a dark brown colour, nearly odourless and tasteless; entirely soluble in alcohol and ether, and insoluble in bisulphide of carbon.

In an essay on this balsam, Mr. W. P. Creecy, of Mississippi, states that the acid obtained by sublimation gave no odour of oil of bitter almonds when treated with hypochlorite of calcium, and hence he concluded that it was benzoic acid. Not having been able to detect the presence of benzoic acid in the balsam, and doubting its existence, the above-mentioned experiment was repeated in this case, but with different results. A portion of the balsam was

mixed with sand, and carefully heated in Mohr's apparatus for benzoic acid. A sublimate was obtained, consisting of white acicular crystals, with a slightly empyreumatic odour. A portion was treated with hypochlorite of calcium, and at once gave the decided and characteristic odour of oil of bitter almonds, thus proving that it was cinnamic and not benzoic acid, as averred by Mr. Creecy. If benzoic acid exists in the balsam at all, it must be in very minute quantity, as all the methods applied failed to detect it.

The use of petroleum benzin in obtaining cinnamic acid in a pure state, as suggested by Professor Maisch, was found highly preferable to alcohol, which is the solvent recommended by Gmelin and others. Benzin dissolves only the acid, and on cooling deposits it in a pure state, free from all traces of resin and colouring matter. Alcohol also dissolves the acid, but takes up along with it the adhering resin, rendering it difficult to purify. The acid is also more soluble in alcohol than in benzin, and hence the loss in the mother-liquor is greater. The same advantages from the use of benzin will also be observed in extracting styracin.

The foregoing experiments serve to show the very close analogy between the balsam of *Liquidambar styraciflua* and that of *L. orientale*. In this case the balsam of the former was treated in the manner given by Gmelin in the examination of styrax, and precisely the same result obtained, and in similar quantities. The balsam also somewhat resembles storax in its physical properties; the tree producing it belongs to the same natural order, and hence it is natural to conclude that by a proper treatment of the fresh bark, a product similar to, and answering all the purposes of, liquid styrax, may be obtained.

Adulteration of Balsam of Peru with Styrax Liquidus. H. Schweikert. (*Neues Jahrb. der Pharm.*, xl., 173.) The writer met with a sample of balsam of Peru, which, though it stood the test with sulphuric acid, appeared suspicious on account of its low specific gravity (1.12), and its behaviour to petroleum ether. When subjected to Hager's test for alcohol, only a very small quantity of the latter was found in the distillate, but drops of a volatile oil were observed, having in a marked degree the odour of styrax.

In order to establish the possibility or probability of such an adulteration, the writer dissolved 30 grams of styrax in four to five times its weight of alcohol, and filtered the solution: oily drops were observed to pass through the filter, and to form star-shaped crystals of styracin in the filtrate after cooling. After this filtrate had been kept over night in a cold place it was filtered again, and,

being now quite clear, it was evaporated on a water-bath to drive off the alcohol, when a brown transparent clear residue of the consistence of styrax liquidus remained, which was found to be soluble in alcohol in any proportion. Mixed with sufficient alcohol to the consistence of balsam of Peru, a syrupy liquid was obtained, which greatly resembled balsam of Peru in its odour, and could only be distinguished from it by its somewhat lighter colour. Its reaction with sulphuric acid was the same as that of balsam of Peru. With petroleum ether, however, it formed a turbid solution which soon deposited a balsamic substance. The specific gravity of this styrax balsam was 1·087–1·09, whereas balsam of Peru has a specific gravity of 1·15–1·16. These figures show that the suspected sample of balsam contained from 50 to 55 per cent. of styrax. It will be seen from the above how readily balsam of Peru may be adulterated with styrax, and that petroleum ether is far superior as a test for the purity of balsam of Peru to sulphuric acid, which is recommended in the German Pharmacopœia.

Cortex Juglandis Cinereæ. Edward S. Dawson. (*Amer. Journ. Pharm.*, April, 1874, 167.) The bark and leaves of this tree are, practically, the medicinal portions. The bark, under the name of “Juglans,” is the only part recommended to be used by the U.S. Pharmacopœia, and should be collected between the months of May and July. The bark used by the author was obtained from the stem of the tree, and was collected during the month of July, 1873. It was from $\frac{3}{8}$ to $\frac{3}{4}$ of an inch thick, and consisted of a liber ranging from $\frac{1}{4}$ to $\frac{1}{2}$ inch in thickness, which was covered with a greyish coloured corky layer. This was marked with irregular longitudinal fissures, and penetrated very unevenly into the liber. When first taken from the tree the liber was white, but on exposure to the air, it first acquired a lemon-yellow, and ultimately a deep brown, almost black colour. The odour was strong and peculiar, and the taste was bitter and very acrid. The liber, freed from the corky layer and dried, was quite smooth on its inner surface; its transverse fracture was somewhat fibrous, and its longitudinal fracture uneven. A cross section of the liber shows the bast fibres to be placed tangentially, and it has a checkered appearance, which is caused by the radial medullary rays crossing the tangential rows of bast fibres. The author recommends that the bark be dried at once after collection, as it otherwise loses its bitter acrid taste, and acquires a resinous flavour. It possesses mild cathartic properties, and has acquired considerable reputation in bowel affections, particularly in cases of dysentery. It is given in the form of decoction or extract,

never in substance. An extract of the bark is officinal in the U.S. Pharmacopœia, and when given in doses of grs. v.-x., acts as a mild laxative, and in doses of grs. xx.-xxx., as a purgative. Under the name of juglandin an eclectic resinoid is sold, which does not however, appear to have any decided medicinal virtues. A tincture of the bark, of such a strength, that fl. ʒ xvi. of it will represent two troy ounces of the powdered drug (the menstruum being diluted alcohol), forms a permanent preparation, which, when given in doses of fl. ʒ i.-ij., acts most decidedly as a cathartic. A fluid extract made according to the U.S. Pharmacopœia formula for extract. cinchonæ flav., forms a preparation which fully represents the odour, taste, and medical properties of the bark.

Mr. C. O. Thiebaud had found among the constituents of the bark a volatile acid, juglandic acid, which he considered allied to chrysophanic acid, and also an acid crystallizing in flat tabular crystals. The solvent used by him in isolating these constituents was true benzol. The author used petroleum benzin as a solvent in place of benzol, but obtained results slightly different from those of Mr. Thiebaud.

In the cold infusion, which had an acrid taste, the author found neither albumen nor alkaloid; he adds potassium ferrocyanide, mercuric chloride, and tartar emetic to the incompatibilities mentioned by Mr. Thiebaud, and found that tannin was probably present, as gelatine produced a precipitate.

Trommer's test indicated sugar in the infusion, and the bark exhausted by cold water yielded starch to boiling water.

The decoction of the bark resembles the infusion, but is destitute of its acrid taste. The precipitate with acetate of lead contained tannin, and the filtrate from this lead precipitate contained principally sugar.

The bark (ʒ j.), which had been exhausted with hot water in preparing the decoction, was thoroughly dried, and then macerated in petroleum benzin in a warm place for several days, whereby a yellow liquid was obtained, which, on evaporation, yielded a rather thick oily residue. This residue, freed from benzin, weighed 4.58 grs., which shows for the bark a yield of a trifle over 14 per cent. of fixed oil. It has a dark red colour, slight odour, and a peculiar, slightly pungent taste. At 60° F., it is quite fluid, but between 40° and 50° F., becomes partly solid, owing to the separation of a crystalline body, which is probably stearin. At 20° F. it solidifies into an opaque crystalline mass. The oil is sparingly soluble in 85 per cent. alcohol, almost entirely soluble in absolute alcohol,

and freely soluble in ether, chloroform, and benzol. It is readily saponified by KHO ; and when treated with the latter, yields a clear violet-coloured solution, which, when diluted with water, and treated with NaCl , yields a brownish soap that separates and rises to the surface.

Resin.—About 0.2 grams of a greenish brown resin was obtained by macerating a troy ounce of bark in 85 per cent. alcohol for seven days, and removing the alcohol from the tincture by distillation. This does not, however, appear to represent the whole amount of the resin. The resin is soluble in liquor potassæ, from which, if the solution be concentrated, it is precipitated by acetic acid. Hydrochloric acid precipitates it completely from either strong or diluted solutions. It is slightly soluble in water and in chloroform, and insoluble in benzin. Ether dissolves about 50 per cent. of it. When heated on platinum foil it fuses (at 170°F.) and then takes fire, burning with a smoky luminous flame.

Volatile Oil.—A portion of bark, mixed with rather more than sufficient water to cover it, was subjected to distillation, and from the distillate, which had a slight acid reaction, and a strong peculiar aromatic odour, the author obtained, by cohobation, a colourless liquid, on the surface of which minute globules of oil of a peculiar and not very pleasant odour could be seen floating. The yield of oil was so small that nothing could be determined in regard to it.

Volatile Acid.—About one troy ounce of bark, treated as in the former experiment, yielded the same yellowish distillate, which was agitated with ether until it ceased to be coloured, and the ethereal solution was drawn off. On evaporating the ether an orange coloured residue was left, in which were long acicular crystals, which had an acid reaction, and a hot acrid taste. When treated with liquor potassæ, they acquired a deep violet colour. It is probable that this volatile acid constitutes the acrid principle of the bark, and also that this volatile acid is decomposed at the boiling point of the decoction. The second portion of the distillate was not acid in reaction, and was not subjected to further investigation.

A fresh portion of bark, treated with petroleum benzin, yielded an oily extract, from which neither strong nor diluted alcohol would separate any crystalline principle. The extract, distilled with water, yielded a light yellow distillate, from which ether took up an oily matter, which was not coloured purple by alkalies. But the water in the retort was deep red, and ether dissolved from it an olive-brown amorphous mass, rendered violet by alkalies. No better results were obtained on saponifying the oil with potash, removing

the soap by salt, acidulating with acetic acid, and treating with ether; the residue was acrid, amorphous, of an acid reaction, coloured violet by alkalies, and it stained the hands.

Air-dry bark yielded 5·3 per cent. of ash, containing aluminium, magnesium, calcium, potassium, and sodium, combined with carbonic, sulphuric, hydrochloric, phosphoric, and silicic acids.

Mr. Maisch thinks that the juglandic acid of Messrs. Thiebaud and Dawson, is the same as the nucin of A. Vogel, jun., as the behaviour of alkalies to both substances is the same.

A New Sophistication of Pareira Root. John Moss, F.C.S. (*Pharm. Journ.*, 3rd series, iv., 911.) The author has made a careful examination of two specimens taken from a bale of pareira brava, the contents of which were professedly the root only of *Chondodendron tomentosum*. A cursory inspection was sufficient to show the presence of two totally different structures. One of these, which is hard, heavy, and of a dark brown colour, is plainly the root described by Mr. Daniel Hanbury (*Pharm. Journ.*, Aug. 2, 1873, 81, and Aug. 9, 102); the other, which is lighter in weight, and much less compact in texture, is as evidently a stem, for the majority of pieces are covered with an easily seen bark, the hue of which is variegated by whitish patches of microscopic lichens and occasional green tufts of moss. A comparison of this stem with an authenticated specimen in the museum of the Pharmaceutical Society, leaves no doubt that it is derived from *C. tomentosum*. On the pieces of the stem presented by Messrs. Corbyn & Co., the characteristic warts are shown in a marked manner.

The stem is sickly sweet, yet slightly bitter, in taste. In the root the bitter taste is very much intensified, and indeed predominates over every other. The difference is best noticed by appropriate comparison of the respective infusions.

The author's object is to induce pharmacists to examine their stock of pareira, and so prevent the substitution for the root of the much less active, if not altogether inert, stem. In his opinion, few parcels will be found free from the admixture here described. In the first place the admixture occurs in original packages; and in the second, it is very unlikely that experience of this kind is confined to one house. In two bales, the aggregate contents of which were 137 pounds, the author found 73 pounds of stem.

Gelsemium Sempervirens. Dr. J. Sawyer. (*Pharm. Journ.*, 3rd series, iv., 998.) *Gelsemium sempervirens*, commonly called the yellow jasmin or woodbine, belonging to the natural family Apocynaceæ, grows plentifully in the Southern States of North America.

The plant has a shrubby, twining stem; the leaves are ovato-lanceolate, opposite, entire, smooth, and of a dark green colour; the flowers are large and yellow; the corolla is gamopetalous and infundibuliform; it has five stamens inserted on the corolla and alternate with its lobes; the pistil is composed of two distinct carpels. The flowers are so strongly scented that they perfume the neighbourhood in which the plant grows. The root, the part employed medicinally, comes to England cut up into small pieces, the larger pieces being from half an inch to two inches in length, and about a quarter of an inch in thickness. Wood zones and medullary rays are visible to the naked eye. The root is brown externally, and of a greyish colour internally. The active properties of the plant are said to depend upon the gelseminate of gelsemia.

Gelsemium is not generally known to English practitioners, although it has been largely used in medicine for some years in America. In England it has been principally employed by homœopaths and disciples of "botanic medicine." From various sources the author has been enabled to gather the following account of its properties. The drug acts mainly upon the nervous system, impairing the sensibility of the sensory nerves. It has no direct action upon the heart. In large doses it gives rise to a general feeling of oppression and numbness, objects are seen double, and, if the dose be large enough, there may be complete paralysis of the voluntary muscles, and insensibility. The plant, like many of the natural family to which it belongs, is very poisonous, and should be used with caution. Several deaths from poisoning by gelsemium have been recorded. Death seems to arise from asphyxia, the result of paralysis of the muscles of respiration. The drug has been said to be a specific in the headache and sleeplessness of the drunkard; in sick-headache it seems to have proved useful; it has been recommended in some forms of dyspepsia, attended by considerable flatulence. It has been thought to aid the obstetrician in cases of rigidity of the os uteri; it has been praised as a remedy for dysmenorrhœa; and there appears to be good reason for believing that it is capable of decidedly relieving toothache and some neuralgic affections. Its virtues, like those of very many other drugs, have probably been grossly exaggerated; but the author had seen enough of the employment of gelsemium to feel sure that more extended experience and careful investigation will establish it as a valuable addition to the *materia medica*.

American pharmacists prepare a liquid extract. The dose of the powdered root is from one to two grains. Mr. Dewson, of the

Queen's Hospital, gives the following formula for the tincture:—Take of gelsemium root in coarse powder, two ounces; of rectified spirit, twenty fluid ounces. Moisten the powdered root with ten ounces of the spirit, and allow the mixture to stand for twenty-four hours. At the end of that time pack in a percolator, and add the remaining ten ounces of spirit. When the fluid has ceased to flow, remove the contents of the percolator and press them. Add the pressed liquid to that obtained by percolation, filter, and make up with rectified spirit to a pint. Eleven minims are about equal to one grain of the root. The liquid extract would be best prepared from the fresh root. The tincture is only slightly darkened by perchloride of iron, and but a very small precipitate is produced; it contains, therefore, only a minute quantity of tannin, and may be prescribed with salts of iron.

Following the example of Dr. W. Legg, the author has only given gelsemium in cases of odontalgia. In hospital out-patient practice there are a large number of cases of neuralgic pains in the face and jaws, associated with carious teeth. The patients are frequently ill-fed and badly nourished women. The author selected examples of the malady, in which there were no very evident local inflammatory complications. In these he gave the tincture of gelsemium in doses of fifteen minims every six hours in an ounce of dill-water. He very rarely gave anything else or made any local application. Out of about twenty cases the use of the remedy was followed by decided and lasting relief in all but three or four instances. The relief was not usually experienced till after the third or fourth dose.

On the Root of Euphorbia Ipecacuanha. Christopher Petzelt. (*Amer. Journ. Pharm.*, 4th series, iv., 255.) The root, which is the officinal portion, and which is equally efficacious at whatever time it is collected, was reduced to powder. This powder was macerated with ether for six days, transferred to a percolator, completely exhausted with ether, and the percolate set aside for future experiments. The residue was transferred to a capsule, and set in a warm place to facilitate the evaporation of the remaining ether. This residue, after being macerated with alcohol of 95 per cent. for four days, was exhausted with alcohol in a percolator, the percolate set aside, and the remaining alcohol driven off from the residue.

The powdered root, after complete extraction by ether and alcohol, was digested in water, acidulated with hydrochloric acid, at a temperature of 80°, for eight days, strained, filtered, and the filtrate set aside for future investigation.

Experiment 1.—The clear ethereal tincture was allowed to evaporate spontaneously. A soft yellow mass was left behind, which was dissolved in benzin, allowed to evaporate spontaneously, and found to consist of wax and fixed oil.

Experiment 2.—The clear alcoholic tincture was evaporated by a water-bath to a small bulk, set aside for three days; but no change taking place in its appearance, it was evaporated by a steam-bath. A dark-brown soft resinous mass resulted, the taste of which is at first feeble, but when kept on the tongue for a short time, or brought in contact with the palate, has a nauseous and very pungent taste. When half a grain of this resinous matter was swallowed it acted as a cathartic, producing watery stools; in doses of one and a half or two grains it produced nausea and vomiting.

It appears, according to a statement of the late Dr. Hewson, of Philadelphia, that this emetic was the subject of an inaugural essay by Dr. Royal, and that experiments conducted with it among the convicts in the Walnut Street Prison proved it to be advantageously available for all purposes of an emetic.

Experiment 3.—This resinous matter is insoluble in ether and benzin. When treated with acidulated water until completely exhausted, the solution gave no precipitate with iodohydrargyrate of potassium or tannin. When redissolved in alcohol it is copiously precipitated on addition of a solution of subacetate of lead.

Experiment 4.—The acidulated aqueous extract of the root, previously exhausted by ether and alcohol, contained sulphate of calcium as its chief mineral constituent.

Experiment 5.—A portion of the root was boiled in water, and the decoction strained, being too thick and gummy to filter through paper. It afforded no precipitate with gelatin, was coloured intensely blue by iodine, was not affected by sesquichloride of iron, but copiously precipitated by subacetate of lead.

Experiment 6.—A decoction of the root contains glucose, as it readily reduces oxide of copper in Trommer's test.

The experiments indicate that the emetic and cathartic properties of the root of *Euphorbia ipecacuanha* are solely due to its resin.

This resin may be prepared by reducing a given quantity of the root to a moderately fine powder, and exhausting it in the usual manner with alcohol, distilling off this menstruum, adding the residue to water, washing and drying the precipitate, which is soft and of a yellowish colour, partly soluble in ether; when dissolved

in the officinal solution of potash, it is, like the resin of jalap, not precipitated on the addition of dilute muriatic acid in excess.

The constituents found in the root of *Euphorbia ipecacuanha* are resin, fixed oil, wax, starch, glucose, and inorganic salts.

Notes on *Gigartina Acicularis*. J. Dalmon. (*Répert. de Pharm.*, i., 696.) The author has frequently observed the presence of *Gigartina acicularis* in carrageen moss (*Fucus crispus*, L.; *Chondrus polymorphus*, Lam.), and has received samples of moss found in commerce, in which this adulterant amounted to as much as 40 per cent. There is no difficulty, however, in detecting this admixture.

The *Gigartina acicularis*, Lam., belongs, like the *Fucus crispus*, to the order of the Algæ, suborder Choristosporeæ. It differs from the latter by its cylindrical, cartilaginous, subdichotomous, flexuous fronds, with acuminate branches, which are most frequently bifurcated, and send out lateral, horizontal, spiniform branchlets. The conceptacles are spherical, sessile, and thin.

The adulteration can also be detected by the slightly brown shade which the pedicles retain, and which causes the whole to appear less uniform in colour, and consequently less beautiful, than carrageen.

The *Gigartina acicularis*, brought into contact with cold water, absorbs it rapidly in great quantity, and swells considerably. It dissolves in boiling water, but in a much smaller proportion than *Fucus crispus*; the jelly yielded on cooling is opaque, whitish, and without consistence.

By burning 100 parts of this alga, 16 parts of a residue are obtained, which retains the form of the plant. This ash is partly soluble in water. Its solution is neutral; it is slightly precipitated by nitrate of silver, abundantly by nitrate of barium and oxalate of ammonium. The solution evaporated, and redissolved in water to which some alcohol has been added, gives a crystalline precipitate with phosphate of ammonium.

The insoluble part of the residue consists of carbonate of calcium and silica. The analysis, conducted as above, gave the following results:—

Chlorides of Sodium and Magnesium	0.60
Sulphate of Magnesium	1.20
Sulphate of Calcium	6.60
Carbonate of Calcium	5.40
Silica	2.20

16.00

The test with an acid and starch, applied after calcination with potash, proved the absence of iodine. From a practical point of

view, the adulteration of carrageen with *Gigartina acicularis* offers no advantage to the pharmacist, who would not obtain with this product a jelly of the consistence generally required in the preparation of jellies from carrageen moss. Nevertheless, the remarkable quantity of the calcareous salts contained in *Gigartina acicularis*, together with its mucilaginous principle, probably constitute it a pretty active remedy in various cases, especially in relaxed conditions of the intestinal canal.

Ophelia Chirata, Active Principles of. Dr. Kemp. (*Archiv. der Pharm.*, 1874, 79; from *Pharmaceut. Zeitschr. für Russland*, xii., 1873, 216.)

Ophelia Chirata, a native of the mountainous parts of Northern India and belonging to the natural order Gentianaceæ, owes its tonic properties mainly to a bitter amorphous constituent called chiratine, $C_{26}H_{48}O_{15}$. This substance may be prepared in the following manner. The plant is exhausted with water at $50^{\circ}C$.; the infusion precipitated by subacetate of lead, filtered, and the filtrate precipitated by a mixture of solution of acetate of lead and liquor ammoniæ. The latter precipitate is first washed with water rendered alkaline by ammonia, and then with alcohol; it is then suspended in alcohol, mixed with sulphuric acid, the sulphate of lead removed by filtration, the filtered liquid shaken with carbonate of calcium, again filtered, and the filtrate evaporated, when the chiratine will be obtained as an uncrystallizable, transparent, amorphous, hygroscopic substance. It is soluble in water and alcohol, and has an intensely bitter taste. The aqueous solution is neutral to test-papers and rapidly suffers decomposition, depositing an almost tasteless resin.

Besides chiratine the plant contains *Ophelic acid*, $C_{13}H_{20}O_{10}$, a yellowish brown syrupy liquid, of a slightly acid and strongly bitter taste, and a peculiar gentian-like odour. It is soluble in water and alcohol; it forms precipitates with metallic oxides, and reduces a solution of ammonio-nitrate of silver.

Anacardium Occidentale. C. Coll y Toste. (*Repert. d. Pharm.*, 1873, 739; from *El Anfiteatro anatomico Español*, 1873, 12, 145.) Among the various species of *Anacardium*, the above appears to be the most important. It is known in America by different names, viz.: *Anacardium occidentale*, L.; *Acajuva occidentalis*, Gaertn.; *Cassuvium pomiferum*, Lam.; *pajúil* in Porto Rico; *marañon* in Cuba; *merey* in Venezuela; *acajou à fruit*, *acajou à pommes*, in Guadeloupe and Martinique; *cashew-tree* and *cashew apple* in Jamaica. It is a forest tree growing on sandy soils, and belonging to the order Tere-

binthacæ. The stem is 8-10 metres high, and 25-40 centimetres in diameter, with numerous smooth branches, bearing thick, ovate, entire, opposite, shortly petiolate leaves; the flowers are small, pale yellow, with red stripes, and arranged in spikes. The fruit is a reniform nut, about one inch long, half an inch thick, and three-quarters of an inch broad, of a smooth shining greyish exterior; it contains a white, oily, almond-like, sweet seed. Within the thick pericarp there are numerous alveolæ, filled with a sticky oleo-resinous substance, which, when the nut is cut longitudinally, exudes in the shape of almost colourless drops which rapidly turn black in contact with the air. This substance is a very powerful caustic, producing vesication almost immediately on contact with the skin, and bringing out a scurf if allowed to act for some time. It remains liquid in tropical climates, but becomes solid in colder regions, forming small needles. It is insoluble in water, on which it floats, but soluble in alcohol. In Porto-Rico it is used extensively as a vesicant and pustulant. It is composed of a crystallizable fatty acid called *anacardic acid*, and an oily liquid known as *cardol*; to the latter it owes its vesicant properties.

The bark of the tree is used in the form of a decoction as an astringent tonic. A gum exuding from the bark is known as *gomme d'acajou* in France, and as *cashew-gum* in England, which according to Guibourt contains arabin, and possesses the general properties of gum arabic.

Maclura Aurantiaca (Nuttall). Alexander King. (*Amer. Journ. of Pharm.*, June, 1874, 257.) The proximate analysis of the bark of the root of this tree was undertaken in the hope of proving therein the existence of the colouring matters known as morin and morotannin. These acids were obtained by R. Wagner from the wood of *Morus tinctoria*, or fustic, and to them is due the value of this wood as a dye-stuff. Fustic has no use whatever in medicine, but is very largely consumed in the arts for dyeing yellow, and for this purpose alone large quantities are imported from the West Indies and South America. The *Maclura aurantiaca* is very abundant in the southern portions of the United States, and has been used to some extent as a substitute for fustic, some even asserting its superiority over the latter. A colouring matter sold under the name of aurantin has been looked upon as an extract from the wood of *Maclura aurantiaca*; it is said to be much stronger than the yellow dye known as flavin, and nearly five times the strength of Persian berries. In some portions of the South, the wood of *Maclura aurantiaca* is not only used for dyeing, but also for tanning. From

these facts, as also from the physical properties of the wood of the *Maclura aurantiaca*, and its close botanical relation to *Morus tinctoria*, it was thought the same acid principles could be obtained from it. With this object in view, the following examination was made, and the results show conclusively that these principles exist in *Maclura aurantiaca*, though not in large quantity.

Maclura aurantiaca, Nuttall, natural order Urticaceæ, is a small bushy tree, rising to the height of 25 or 30 feet, dividing near the ground into numerous slender branches. Leaves petiolate, entire, five to six inches long, and two to three inches broad, ovate, acuminate, smooth and shining on the upper surface, on the under side minutely pubescent. Fruit, when ripe, resembles the largest oranges, composed of numerous coalesced, rather woody carpels, giving the surface a tuberculated appearance. Seeds imbedded in the fibrous mass, about the size of those of a quince.

The root as obtained presented the following appearance. In various sized pieces, from a quarter of an inch to one and a half or two inches in diameter, heavy and compact; the woody portion of a yellowish white colour; bark resinous, of a lighter appearance than the wood, where cut by the knife showing a greenish black colour, and having a slightly bitter and astringent taste, freely exfoliating in thin papyraceous layers, of a handsome orange colour.

A filtered decoction of the bark was submitted to the following preliminary tests.

Iodine gave a slight blue coloration, showing the presence of starch.

The addition of two volumes of alcohol produced a copious precipitate, which was found to be entirely soluble in cold water, showing the absence of pectin. Upon reprecipitation by alcohol, and washing the precipitate with alcohol, the substance was obtained nearly white and showed the characters of a gum.

By Trommer's test the decoction showed abundant evidence of the presence of glucose.

Ferrie chloride produced a greenish black coloration, which was not evanescent upon being heated, thus proving the absence of gallic acid, and indicating the presence of tannin. Solution of gelatine formed no precipitate, thus showing that gallo-tannic acid was not present.

Alkalies produced a bright yellow colour, pointing to the presence of moric acid.

To litmus the decoction gave a decided acid reaction.

With iodohydrargyrate of potassium no precipitate was produced.

When digested with animal charcoal, the decoction was entirely deprived of all bitter taste and colouring matter, alkalies not striking a shade of colour with the liquid filtered from the charcoal. Experiments having in view the separation of the colouring principles from the charcoal gave no satisfactory results.

The decoction, upon evaporation, gave a soft extract, of a brown colour, and having a sweet, astringent taste, with a trace of bitterness.

A cold infusion of the fresh bark, when heated to boiling, was not coagulated, showing the absence of albumen. With alkalies and ferric chloride the infusion gave the same reactions as the decoction.

By distillation of a portion of the fresh bark with water, a liquid was obtained, having the odour of the bark, but being perfectly clear and transparent. This would indicate the presence of but a small amount of volatile oil.

The distillate gave no coloration with alkalies, showing the non-volatility of the colouring principles with the vapours of water.

For the purpose of a more complete examination, eight ounces of the fresh bark were cut up small, and boiled repeatedly with water until exhausted. The dregs from this boiling were dried, and then reduced to powder. The mixed decoctions were filtered, and evaporated to eight fluid ounces. From this the gummy matter was precipitated by alcohol, and separated by filtration, and the filtrate evaporated to a soft extract which was redissolved in alcohol. From this the glucose was precipitated by ether and separated. The ethereo-alcoholic solution was mixed with water, the ether and alcohol removed by distillation, and the aqueous liquid set aside. After standing for two or three days a deposit was formed, which was found to be moric acid. The mother-liquor contained morintannic acid. The moric acid also contained a small quantity of morintannic acid, which was proved by the ferric chloride test. This should give a garnet-red coloration, with pure moric acid, but the colour produced was a greenish black, which, according to Wagner, is the colour obtained if the moric acid is contaminated with any morintannic acid.

Upon examination of the substance for bases, calcium and iron in the ferric state were clearly proved, thus showing it to consist of these metals with excess of moric acid. The presence of morintannic acid in combination with iron would explain the dark green colour of the moric acid.

Mordanted cotton cloth immersed in the acid, produced a fine yellow colour, which however was not entirely permanent.

The mother-liquor from which the moric acid was obtained, showed, when examined by the usual tests, the presence of morin-tannic acid.

The dregs left after exhaustion of the bark with water, being dried and reduced to powder, were exhausted with alcohol by percolation, and yielded a dark red resinous tincture, from which the resin, precipitated in a large quantity of water, was separated and dried. Ether dissolved nearly two-thirds by weight of this resin, which was entirely soluble in the fixed alkalies. The alcoholic solution was reprecipitated by acids.

The fresh bark contained 28 per cent. of moisture, and also the following constituents: carbonic, phosphoric, sulphuric, and hydrochloric acids; calcium, potassium, sodium, magnesium, and iron.

From the foregoing analysis of the bark of the root of *Maclura aurantiaca* its constituents may be said to be starch, glucose, gum, resin, volatile oil in minute quantity, moric and morintannic acids.

A partial examination of the woody portion of the root gave evidence of the presence of colouring matter, though apparently in much smaller quantity than in the bark.

The Medicinal Plants of the Scrophulariaceæ. John R. Jackson. (*Pharm. Journ.*, 3rd series, iv., 1033.) Though the foxglove (*Digitalis purpurea*) is the only officinal plant of the B.P. belonging to the Scrophulariaceæ, this order comprises many other species useful and valuable as medicines, and applied as such in other countries.

In North America, many of the *Scrophulariæ* are used in medicine. *Scrophularia nodosa*, L., the figwort, a plant growing some two or three feet high, and found in woods and thickets over a good part of Europe, was at one time officinal in the Dublin Pharmacopœia, the leaves being used in the preparation of an ointment.

In some parts of Europe, as well as in America, they are occasionally used, as well as the roots, for making poultices for ulcers, tumours, burns, and cutaneous eruptions. The leaves have a rank, disagreeable smell, and an acrid bitter taste, and the root has also a nauseous odour.

The leaves of this plant were, at one time, supposed to have tonic, diaphoretic, and anthelmintic properties, and were advocated for the cure of scrofula. Farmers occasionally use a decoction of the leaves for curing scab in pigs.

The great mullein, *Verbascum thapsus*, L., a well-known British plant, in gravelly, sandy, or chalky soils, is common also in

neglected fields and along roadsides in the United States. The thick woolly leaves have a mucilaginous, bitter taste, which is extracted by infusion in water. They are demulcent and emollient; and were at one time much valued, not only in domestic practice, but by practitioners, in catarrh and diarrhœa. Sir James Smith testifies to their value in the following words: "A pint of cow's milk, with a handful of the leaves of this mullein boiled in it to half a pint, sweetened, strained, and taken at bedtime, is a pleasant emollient and nutritious medicine for allaying a cough or removing the pain and irritation of the piles." The leaves steeped in hot water, are not unfrequently used by country people as poultices in hæmorrhoidal complaints. In Sweden and Norway a decoction of the leaves is given to cattle suffering from cough or pulmonary diseases. The flowers, it is said, when dried in the sun, give off a fatty substance, which is used in Alsace as a cataplasm. Porcher, in his "Resources of the Southern Fields and Forests," thinks that sufficient attention has not been paid to this plant as a medicine, and strongly recommends the desirability of making a careful analysis. In an enumeration of the uses to which the plant is put in North America, he states that the leaves steeped in hot water are applied externally as a feeble anodyne emollient dressing for sores, for the relief of headache and frontal pains, and are much used by the poorer classes. The leaves of this plant and the bark of the root of sassafras, in equal parts, boiled in water and concentrated, then mixed with powdered sassafras bark to form pills, are said to be valuable in the treatment of ague; and finally, he refers to a report of "several cases, in which the paroxysms of intermittent fever were completely prevented by the administration of the warm infusion of the fresh root. Four ounces of the fresh root to one pint of water reduced one-half by boiling, of which two ounces were given every hour, commencing four hours previous to the expected chill."

Other species of *Verbascum* have been said to possess similar properties to the species just mentioned.

In the genus *Veronica*, which is well-known in this country as including some of the prettiest of our native flowers, we find several species have been used at various times in medicine. The well-known and beautiful little plant, the germander speedwell (*Veronica chamædrys*, L.), was at one time valuable amongst the old herb-doctors as a vulnerary, and Gerarde recommends the root as a specific in pestilent fevers.

The leaves of the common speedwell (*V. officinalis*, L.) are astrin-

gent and bitter, and were, even up to a comparatively recent date, not only used as medicine in this country but also as a substitute for tea. The plant grows in South Carolina, and, though not at present included in the United States Dispensatory as an official medicine, it is nevertheless, after careful examination, reported to contain "in the fresh juice and an extract from the herb, a bitter principle, soluble in alcohol, but scarcely so in ether; an acrid principle, red colouring matter, a variety of tannic acid, a crystallizable fatty acid, with malic, tartaric, citric, acetic, and lactic acids; a soft, dark, green, bitter resin and mannite." The brooklime (*V. Beccabunga*, L.), also a British species, and found in moist places, was formerly valued as an antiscorbutic, the leaves and young tender stems being the parts used. In some parts the leaves are occasionally applied as a styptic to wounds, and when bruised are also applied to burns. Like the former, this species has been used in North American practice for purifying the blood.

Within the last few years, some attention has been given in America to the Virginian veronica or culversroot (*Veronica Virginica*, L.). It is a perennial plant, common in the United States in mountain valleys, and grows to a height of three or four feet. The root is the part used: it is bitter and nauseous, and imparts its active properties to boiling water. The fresh root is an active cathartic and emetic. A large teaspoonful of the root boiled in a gill of water, repeated every three hours, is said to be an efficient purgative, operating with mildness and certainty, and peculiarly adapted to typhoid and bilious fevers.

The *Gratia Dei*, so called in olden times on account of its active medicinal properties, and known also as the hedge hyssop by the herbalists, is the *Gratiola officinalis*, L. It is a perennial herb, common in moist places in the South of Europe, where it is used in dropsy, jaundice, scrofula, chronic hepatic affections, etc. In large doses, it is poisonous. "According to Vauquelin, the purgative property depends upon a peculiar substance analogous to resin, but differing from it in being soluble in hot water. Dr. Whiting has announced the existence of veratria in it, which accounts for its active properties." Though not used in medicine in this country, it is said to have formed the chief ingredient in a once famous nostrum for gout, known as "eau médicinale." In some of the meadows of Switzerland the plant is said to be so abundant that it is dangerous to allow cattle to graze in them.

In a recent American list of "Pure Medicinal Preparations prepared *in vacuo*" at New Lebanon, occurs a preparation from

Chelone glabra, L. The plant is known as the snake-head, or balmony, and grows in damp soils. Its action is described as follows in the catalogue above referred to: Tonic, cathartic, and anthelmintic, valuable in jaundice and hepatic diseases, likewise for the removal of worms. Used as a tonic in small doses in dyspepsia, debility of the digestive organs, and during convalescence from febrile and inflammatory diseases. Fluid extract: dose, 1 dram. Chelonin: dose, 1 to 2 grains. Amongst the medicinal plants prepared by the society known as Shakers, the foliage and twigs of *Chelone glabra* are included.

In Kumaon and other parts of India, the roots of *Picrorrhiza kurroa*, Royle, are used in medicine as a tonic and antiperiodic, and are sold in the bazaars, where they occur in short brittle pieces, of a dark colour, somewhat irregular, about the thickness of a goose-quill, but tapering towards the extremities, and covered at this part with numerous small rootlets. They have a dark brown fracture when broken across, and an intensely bitter taste. This medicine is placed in the Indian Pharmacopœia amongst non-official articles, with the remark that "it would be desirable to have more information with regard to this root and its properties." Other Indian *Scrophulariaceæ* included in the Pharmacopœia, but not official, are, *Herpestis Monniera*, H. B. K., and *Celsia Coromandeliana*, Vahl. The first of these is regarded by the Hindoos as a powerful diuretic and aperient; the juice of the leaves, in conjunction with petroleum, is used as a local application in rheumatism, and the juice of the leaves of the *Celsia* is said to have been given with advantage in cases of acute and chronic dysentery.

Small quantities of the flowers of *Lyperia crocea*, Eckl., have occasionally been brought into this country from the Cape of Good Hope as a dye, but have hitherto failed to attract buyers. As imported, the flowers have somewhat the appearance and smell of saffron. Dr. Pappe, in his "*Floræ Capensis Medicæ Prodrômus*," says: "This bush deserves notice as a drug, and in all probability will, ere long, become an article of colonial export. It grows abundantly in some parts of the Eastern districts, whence it has found its way into the dispensary. The flowers, which are called *Geele bloemetjes*, closely resemble saffron in smell and taste; they possess similar medical properties, and as an antispasmodic, anodyne, and stimulant, ought to rank with the *Crocus sativus*. Here they have as yet been only used with success in the convulsions of children, but they deserve a more general trial. On account of the fine orange colour which they impart, they are in daily request

among the Mohamedans, who use them for the purpose of dyeing their handkerchiefs. This drug has been observed to be sometimes adulterated by the admixture of other plants of the same genus, which are less efficacious."

Amongst plants of lesser utility belonging to the same order, it will suffice to mention the eyebright, *Euphrasia officinalis*, a decoction or infusion of which is still occasionally used in some parts as a wash for disorders of the eye. It is astringent and slightly bitter. The yellow toad flax, *Linaria vulgaris*, is said to be purgative, and was at one time used by the herb doctors for the cure of dropsy. *L. Cymbalaria*, some species of *Antirrhinum*, *Pedicularis palustris*, and *P. sylvatica*, have all been used by herbalists, but they are not of sufficient importance to call for further remark.

PHARMACEUTICAL CHEMISTRY.

PART II.

PHARMACEUTICAL CHEMISTRY.

The Detection of Hydrocyanic Acid in Poisoning Cases. H. Struve. (*Zeitschrift für Analytische Chemie*, 1873, 14.)

The author gives a full and interesting account of a case of poisoning with hydrocyanic acid, in which he succeeded in detecting the poison in the body eight days after death.

He distilled 6 grammes of the blood with 20 c.c. of distilled water and a few drops of a solution of tartaric acid (to render the mixture acid), until 5 c.c. of a colourless acid liquid had passed over.

One half of the distillate was mixed with a few drops of ammonium sulphide, evaporated nearly to dryness on a water-bath, then mixed with a few drops of water, acidulated with HCl, and tested for sulphocyanogen with a weak solution of ferric chloride. The distinct red colour produced left no doubt as to the presence of H Cy in the blood.

The second half of the distillate was rendered alkaline by the addition of a weak solution of potassium hydrate, evaporated on a water-bath, then shaken for some time with a few drops of a weak solution of ferrous sulphate, and finally acidified by the careful addition of HCl. The mixture appeared pale yellow, and did not deposit the least trace of Prussian blue, not even after standing for a considerable time.

The contents of the stomach were examined next. 88 grammes of the same were mixed with a little tartaric acid, and distilled as before; the colourless distillate gave unmistakable indications of the presence of H Cy upon being tested with ammonium sulphide and ferric chloride, but the testing with ferrous sulphate again led to a negative result.

46 grammes of liquid from a bottle containing the liver, kidneys, stomach, and intestines, were subjected to the same treatment with precisely the same results as were obtained in the two previous experiments.

The chemical testimony was fully borne out by the judicial investigation, which proved that the deceased had committed suicide by taking cyanide of potassium.

The author then conducted a series of experiments with the object of further comparing the principal tests for hydrocyanic acid. Operating with exceedingly weak solutions of H Cy and K Cy, in which Ag N O₃ failed to produce the slightest precipitate, he found that the test based upon the conversion of H Cy, into a sulphocyanide greatly exceeds the Prussian blue test in delicacy. It is equalled however, if not surpassed, by the test with guaiacum resin and cupric sulphate, by which, according to Preyer, $\frac{1}{12000000}$ of H Cy can be detected, provided that due care be taken to avoid mistakes, as a number of other substances (nitric acid, nitrous acid, hydrochloric acid, chlorine, iodine, bromine, ammonia, dilute sulphuric acid, chromic acid, etc.), produce a similar reaction with guaiacum and copper.

Whenever there is sufficient material at hand this test may be applied in addition to the sulphocyanide and Prussian blue tests, and the author recommends that in such cases the liquid to be distilled should, if acid, be rendered slightly alkaline by K H O, and a current of pure C O₂ passed through it during distillation. He considers the use of carbonic acid as safer than that of sulphuric or tartaric acid, because C O₂ would only liberate H Cy from a simple cyanide but not from a sulphocyanide. This is important, as sulphocyanides occur normally in the saliva, from which they may find their way into the stomach, and finally into the general circulation. In distilling four samples of human blood with water and a few drops of tartaric acid, the author succeeded in one case out of the four in detecting sulphocyanogen in the distillate. In forensic analyses, a part of such a distillate should therefore be evaporated with a few drops of ammonia, and the residue tested with Fe₂ Cl₆; if sulphocyanides are thus proved to be absent, another part of the distillate may be safely evaporated with ammonium sulphide, and the residue treated in the usual manner, the production of a red colour with Fe₂ Cl₆ will then furnish an absolute proof that the cyanogen found existed in the substance under examination as H Cy, or as a cyanide, and not as a sulphocyanide.

The treatment with ammonium sulphide, etc., appears to be superior to and certainly much more reliable than the testing with guaiacum and Cu S O₄, which, as the author shows, may produce a reaction with the trace of ammonia invariably present in distillates obtained from animal substances.

Further experiments conducted by the author show that during the evaporation of a solution of ammonium sulphocyanide, a portion of this substance is lost by volatilization; and to prevent this

he proposes that the distillate to be tested for H Cy, should be evaporated with potassium sulphide instead of ammonium sulphide; or if the latter be used, a little K H O should be added previous to evaporation, as a solution of potassium sulphocyanide can be heated without any loss of Cy.

The author also mentions a case of poisoning by K Cy, in which the chemical examination of the body, undertaken eight months after death, failed to show the least trace of a cyanide, but gave distinct indications of the presence of formic acid, which was supposed to have resulted from the decomposition of K Cy. This case induced the author to make an experiment with a mixture of 300 grammes of meat, 400 c.c. of water, and 2.3 grammes of K Cy, which was kept for eighteen months, undergoing complete putrefaction. At the end of that time he still succeeded in detecting the cyanide, but no formic acid could be found.

A New Method of Converting Oil of Turpentine into Cymol. Aug. Kekulé. (*Ber. der deut. chem. Ges.*, 1873, 437.) The author refers to the researches of Barbier and Oppenheim (*Journ. f. pract. Chem.*, lxvi., 219, and *Ber. der deut. chem. Ges.*, v., 215), as tending to show that oil of turpentine is a hydride of cymol. In repeating their experiments he made use of iodine in place of bromine, relying on its more powerful action, and succeeded in producing by one operation the same result which Oppenheim could only obtain by two.

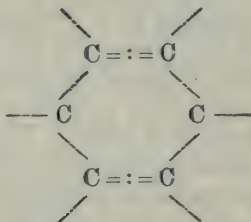
Owing to the very energetic action of iodine upon oil of turpentine, it was added in very small quantities at a time, and the reaction completed by heat before any further addition. After this the substance was repeatedly distilled, and the more fluid portion of the distillate washed with K H O and rectified. The product had the same odour and boiling point as cymol, and yielded toluic acid upon oxidation with nitric acid, and terephthalic acid with chromic acid. In one experiment 10 grammes of cymol were obtained from 50 grammes of oil of turpentine and 23 grammes of iodine. Besides cymol, another hydrocarbon having a high boiling point was obtained, which appeared to be colophene.

The action of iodine upon oil of turpentine seems to be the following. One molecule of oil of turpentine takes up one molecule of iodine, but the biniodide is immediately decomposed into H I, and iodized turpentine. Upon further heating more H I is liberated and cymol formed. The liberated H I appears to form a compound with oil of turpentine, which by decomposition produces colophene.

Comparative experiments with iodine and with bromine proved

that the conversion of oil of turpentine into cymol is effected with far greater facility by the former than by the latter.

The formation of cymol from turpentine, being now fully confirmed, the author has no longer any doubt that oil of turpentine contains six carbon atoms combined in the same manner as in benzol. Methyl is joined to one of the carbon atoms of the ring and propyl to another, both in the same relative position as in cymol. As oil of turpentine contains two atoms of hydrogen more than cymol, it must be assumed that a double union of carbon atoms exists in it but twice, whilst it occurs three times in the nucleus of six carbon atoms present in the true aromatic substances. As to the relative position of the two double unions, he thinks it probable that the carbon nucleus of oil of turpentine possesses the following structure—



By the addition of iodine and the liberation of two molecules of HI, three double unions are brought into the same position in which they are supposed to occur in benzol and the other members of the aromatic series.

Detection of Digitaline and Morphine. H. Brunner. (*Deutsche chem. Ges. Ber.*, 1873, 96.) In order to detect digitaline in forensic investigation, the method of Stas-Otto is not very reliable, because the greater part of this substance is obtained from the acid ethereal solution as a resinous body, which generally fails to produce the characteristic red colour with H_2SO_4 and bromine water, whereas the small portion left in the alkaline ethereal solution cannot be distinguished from aconitine and delphinine, as these two substances yield the same results as digitaline, when evaporated with phosphoric acid, or when treated with H_2SO_4 and bromine water.

The author therefore tried the application of Pettenkofer's test, according to which an intense red colour is produced if a trace of digitaline, dissolved in water, is mixed with a weak aqueous solution of inspissated bile; and sufficient concentrated H_2SO_4 added to

raise the temperature to $70^{\circ}\text{C}.$: and his experiments with this test proved very successful.

1 c.c. of a decoction of 0.3 gramme of foxglove leaves in 180 c.c. of water gave a very distinct reaction.

A solution of 0.05 gramme of digitaline in half a litre of beer, examined with very great care according to Stas-Otto's method, gave a negative result, whereas a very small particle of the residue, dissolved in water, sufficed to produce a most striking reaction with Pettenkofer's test.

Amygdaline, salicine, glycyrrhizine, and other glucosides, produce the same red colour with bile and H_2SO_4 as digitaline, but as the physiological effects of the latter do not permit this poison to be mistaken for any of the other glucosides, the author thinks that this test may be safely applied in toxicological researches.

Lactic acid, tartaric acid, colchicine, and traces of atropine and picrotoxine may also be present in the residue obtained from the acid ethereal solution, but they are not affected by Pettenkofer's test. Nor is this the case with other alkaloids, with the exception of those which, like narcotine, form a red colour with sulphuric acid alone.

Atropine is most readily recognised by its dilating action on the pupil of the eye, and by the peculiar aromatic odour produced by adding the alkaloid to a hot mixture of potassium bichromate or ammonium molybdate and sulphuric acid, and then dropping some water into the hot mixture. This reaction, however, requires very great care and skill in order to ensure success. The alkaloid is best placed upon a few crystals of chromic trioxide in a porcelain dish, and a gentle heat applied, until the reduction of the trioxide causes it to assume a green colour. If performed in this manner, the reaction will be found highly characteristic and reliable.

Researches on Oleum Calami. A. Kurbatow. (*Ber. deut. Chem. Ges.*, vi., 1210.) The author submitted the oil of *Acorus Calamus* to fractional distillation, during which he observed that the temperature rose from 140° to 280° . The portion passing over at 170° , when carefully redistilled, yielded a considerable quantity of a product, boiling at 158° – $159^{\circ}\text{C}.$ This hydrocarbon, whose composition is represented by the formula $\text{C}_{10}\text{H}_{16}$, is clear and colourless, soluble in alcohol and ether, and has a turpentine-like odour, its sp. gr. at 0° is 0.8793. It combines with anhydrous HCl , forming a crystalline mass, which melts at 65° . The portion passing at 240° – 270° yielded, upon careful redistillation, a bluish liquid, boiling at 250° – 255° . The colour of this oil disappeared

upon boiling with metallic sodium, and its boiling point was then found to have risen to 255° – 258° . The formula of this hydrocarbon is $C_{10}H_{16}$; it is sparingly soluble in alcohol, and readily soluble in ether, but does not combine with dry hydrochloric acid.

The Chemical Constitution of Oil of Dill. R. Nietzki. (*Archiv. der Pharm.*, 3rd series, iv., 370.) The oil used by the author was freshly prepared from the fruits of *Anethum graveolens*, dried with chloride of calcium and rectified. During distillation the boiling point rose from 155° to 260° C. A careful fractional distillation and examination of the products obtained proved this oil to contain 10 per cent. of a hydrocarbon, $C_{10}H_{16}$, boiling at 155° – 160° ; 60 per cent. of a hydrocarbon of the same composition boiling at 170° – 175° , and 30 per cent. of another hydrocarbon, $C_{10}H_{14}O$, boiling at 225° – 230° , which is identical with carvol.

As the quantity of that fraction passing over at 155° – 160° was too small for a comprehensive investigation, the author devoted his attention principally to the main fraction boiling at 170° – 175° . All his attempts to obtain this substance free from oxygen by distillation with metallic sodium proved unsuccessful, as the product absorbed oxygen from the air with great rapidity. The most peculiar feature of this hydrocarbon was its odour, which in no way resembled that of oil of dill, but was exceedingly like that of oil of mace. The characteristic odour of oil of dill was, however, immediately restored by the addition of carvol.

The Alkaloids of the Cinchona Barks. O. Hesse. (*Wittstein's Vierteljahresschrift für pract. Pharm.*, xii., 3, 366.)

Quinine.

Having previously published a lengthy report on this alkaloid and its salts (*Annalen der Chem. und Pharm.*, cxxxv., 325), the author in the present essay confines himself to some further remarks respecting them.

Quinine forms three compounds with sulphuric acid: a neutral salt crystallizing from water with $7\frac{1}{2} H_2O$ (probably with $8 H_2O$ if absolutely free from efflorescence), and from alcohol with $2 H_2O$; a salt containing one equivalent of acid, and one containing two equivalents of acid.

The sulphate with one equivalent of acid was first prepared by Baup, and is known in commerce as bisulphate; its formula, according to Gerhard, is $C_{20}H_{24}N_2O_2, H_2SO_4 + 7 H_2O$; according to Kraut it is $C_{20}H_{24}N_2O_2, H_2SO_4 + 7\frac{1}{2} H_2O$, but neither of the two

formulas agrees with the numbers given by Baup. The author's analysis of pure and uneffloresced crystals of this salt confirmed Gerhardt's formula, as will be seen from the following results:—

Calculated from		Found by	
the formula $C_{20}H_{24}N_2O_2H_2SO_4 \cdot 7H_2O$.		Hesse.	Baup.
SO_3	14.59	14.57	13.70
$6H_2O$ given off at the ordinary tem- perature in an exsiccator	19.71	19.82 3.08	22.90 24.66
H_2O given off at 110° to $115^\circ C$	3.28		
	22.99		

This salt is soluble in 11 parts of water at $13^\circ C$., but only sparingly soluble in absolute alcohol.

The sulphate containing two equivalents of acid is obtained by dissolving the preceding salt in an excess of moderately dilute sulphuric acid, and concentrating the solution over sulphuric acid. It separates in delicate white prisms, which may be purified by recrystallization from a small quantity of hot water. This new salt is extremely soluble in cold, and still more so in hot water; it is much less soluble in alcohol, and quite insoluble in ether. Its aqueous solution shows very distinctly the well-known fluorescence of quinine; on exposure to light, the crystals soon assume a brownish red colour. The results of the author's analyses of this salt lead to the formula $C_{20}H_{24}N_2O_2 \cdot 2H_2SO_4 + 7H_2O$, and show the same proportions of water of crystallization as in the preceding salt.

Calculated.		Found.		
		I.	II.	III.
$2SO_3$	24.69	24.61	—	—
$6H_2O$ given off in an exsiccator	16.67	16.62 2.10	16.80 2.63	16.88 2.36
H_2O given off at 100° – $130^\circ C$	2.79			
	18.46			

Of the remaining salts of quinine, the only one mentioned by the author is the hydrochlorate, which has lately given rise to some unfortunate accidents through a substitution of, or an admixture with, hydrochlorate of morphia. Such an admixture or substitution may be readily detected by means of dilute nitric acid (1 vol. of acid to 4 vols. of water), which forms a colourless or very faintly yellowish solution with pure hydrochlorate of quinine, when heated with it to 50° – $60^\circ C$. for a few minutes; but produces a deep yellow or an orange red solution if the hydrochlorate thus acted upon contains morphia. If about .05 gramme of the suspected hydrochlorate be dissolved in $\frac{1}{2}$ c.c. of dilute sulphuric acid in a test-tube, and

another .05 gramme dissolved in $\frac{1}{2}$ c.c. of dilute nitric acid (1 to 4) in another test-tube of the same diameter, and if both tubes are then placed in warm water of 50° – 60° C. for five minutes, the contents of both will be of the same colour if the preparation was pure; but if it contained morphia, the nitric acid solution will be visibly darker than the solution in sulphuric acid. It should be remembered, however, that some other bases, and especially several of the opium alkaloids, produce the same reaction with nitric acid as morphia.

The power of quinine to turn the plane of polarized light to the left was first observed and determined by Bouchardat (*Gmelin organ. Chem.*, iv., 1692), and was subsequently investigated by De Vrij and Alluard (*Chem. Centralblatt*, 1864, 1116), whose results differed materially from those obtained by Bouchardat. Anxious to form a clear judgment on this subject, the author carried out a long series of experiments with the aid of an excellent and large Wild's polarimeter, using the homogeneous sodium flame as the source of the light, and applying such solvents for the respective substances as have no effect themselves on the plane of polarized light. In the following summary of his researches, l represents the length in millimetres of the column of liquid; p the percentage amount of substance in the solution by volume; and a the deviation observed (the mean of eight to twenty observations). The experiments were conducted at 15° C.

I. Sulphate of quinine of the purity required by the German Pharmacopœia was dissolved in dilute H_2SO_4 , the solution largely diluted with water, and the alkaloid precipitated from it by ammonia. After the precipitate had become crystalline it was collected on a filter, well washed and dried, first in the air, and then in an exsiccator. Its alcoholic solution was used for the optical experiment.

With $p = 2.054$ (anhydrous) and $l = 200$, a was found to be -6.70°

II. The same sulphate as used in I. was recrystallized from boiling water, and the alkaloid prepared from it in the same manner as before.

With $p = 3.874$ (anhydrous and in alcoholic solution), and $l = 200$, a was $= -12.86^{\circ}$.

III. Sulphate of quinine of the same quality as used in I. was converted into herapathite. This was suspended in water, treated with H_2S , and the acid liquid, after removing the excess of H_2S and the deposited sulphur, precipitated by ammonia. The precipitate being slightly grey, it was redissolved in dilute H_2SO_4 , the solution deco-

lourized by animal charcoal, and the alkaloid precipitated by ammonia.

a. With $p = 4.269$ (anhydrous and in alcoholic solution) and $l = 100$, a was $= -7.07^\circ$.

b. At the temperature of 25°C. , and with $p = 1.0341$ (in the same condition as before) and $l = 200$, the deviation a was found to be -3.36° .

Calculated from—

Experiment I.	.	.	.	.	$aj = -163.09^\circ$
" II.	.	.	.	.	$aj = -165.97^\circ$
" IIIa.	.	.	.	.	$aj = -165.61^\circ$
" IIIb.	.	.	.	.	$aj = -162.46^\circ$

These results show that sulphate of quinine need not be converted into herapathite in order to obtain absolutely pure quinine from it, but that mere recrystallization from boiling water suffices in the case of any sulphate of quinine which stands Kerner's test (*Annalen der Chem. und Pharm.*, cxxxv., 327).

It will also be seen from the above that the specific rotatory power of quinine in alcoholic solutions diminishes as the temperature is increased, but this diminution is insignificant within the limits of temperature mentioned; and is certainly less than it was stated to be by Bouchardat. In other respects the author's results accord satisfactorily with Bouchardat's, but differ considerably from the values found by De Vrij and Alluard.

The following experiments show that the rotatory power of the salts of quinine depends upon the nature and relative quantity of its acid.

The sulphate of experiment II. was dissolved in strong alcohol, so that p was $= 1.9181$ (anhydrous); with $l = 220$, and a was found $= -8.08^\circ$, from which aj is calculated $= -191.47^\circ$.

The same salt was dissolved in water, and 6 equivalents of SO_3 added (the acid used contained 4 per cent. of SO_3 by volume); $p = 2.6662$, $l = 220$, and $a = -13.42^\circ$; therefore $aj = -228.78^\circ$.

Thus it appears that the presence of 6 equivalents of SO_3 in the aqueous solution of anhydrous sulphate of quinine increases the specific rotatory power of the salt by 37.31° , so that the rotatory power of quinine, in combination as a neutral sulphate, is $aj = -220.43^\circ$, and in acid solution, containing $3\frac{1}{2}$ molecular weights of SO_3 for each molecular weight of quinine, $aj = -264.66^\circ$.

Very different from this is the specific rotatory power of quinine in its sulphate containing one equivalent of acid.

Mean result of two determinations.

For $C_{20}H_{24}N_2O_2H_2SO_4, 7H_2O$	$aj = -156.75^\circ$
For Quinine	$aj = -264.30^\circ$

Quinine in this combination, therefore, possesses the same rotatory power as in a solution of the neutral sulphate in sulphuric acid, and this power can be increased by a further addition of sulphuric acid.

Experiments with the diacid sulphate in alcoholic solution gave—

For $C_{20}H_{24}N_2O_2H_2SO_4, 7H_2O$	$aj = -144.30^\circ$
For Quinine	$aj = -287.62^\circ$

A further addition of sulphuric acid to this salt, caused no notable difference in the deviation. The neutral salt dissolved in dilute H_2SO_4 forms the monacid salt, but the latter, if treated with an excess of H_2SO_4 does not form the diacid salt at once, but only after the lapse of time.

When quinine is combined with hydrochloric acid, different results again are obtained.

For $C_{20}H_{24}N_2O_2HCl, 2H_2O$	$aj = -135.98^\circ$
For Quinine	$aj = -166.41^\circ$
For the salt in hydrochloric solution	$aj = -202.15^\circ$
For Quinine in combination with HCl in hydrochloric solution	$aj = -247.39^\circ$

Thus it appears that the rotatory power of quinine varies with the quality and quantity of the solvent, and with the temperature.

Kerner's γ *quinidine* seems to be nothing but crystallized quinine, having, according to the author's analysis, the formula $C_{20}H_{24}N_2O_2, 3H_2O$.

The so-called quinine of *Reichardt* does not deserve its name, as it is merely an extract obtained by chloroform or ether.

Conchinine.

The author suggests this new name for *Pasteur's quinidine*, because the term quinidine has been used for many different substances. This alkaloid, which was discovered by *Van Hegringen*, occurs in notable quantities in *Cinchona amygdalifolia* and *C. ovata*, but chiefly in *C. Pitayensis*. The author's process of preparing it consists in its precipitation by K I, and removing the hydriodate of cinchonine which may be present by boiling the precipitate with water or alcohol.

De Vrij obtains it from a solution of two parts of quinoidine and one part of tartaric acid; but the tartrate of conchinine, which

thus separates, contains tartrate of cinchonidine, which should be removed by crystallizing the crude product from boiling water, and neutralizing the solution with ammonia. Upon cooling, the neutral tartrate of cinchonidine separates, leaving the conchicine in the mother-liquor, from which it can be precipitated by iodide of potassium.

Conchicine turns the plane of polarized light to the right; its rotatory power in alcoholic solution was found to be $\alpha_j = +260.65^\circ$.

With the neutral sulphate the results obtained were—

For $2 C_{20} H_{24} N_2 O_2, H_2 S O_4, 2 H_2 O$.	$\alpha_j = +216.70^\circ$
For the anhydrous salt	$\alpha_j = +226.87^\circ$
For Conchicine	$\alpha_j = +261.18^\circ$

The same salt was dissolved in water with 1 mol. of $S O_3$, and with 6 mol. of $S O_3$ respectively: the results of the two experiments were:—

	I.	II.
For the anhydrous salt	$\alpha_j = +280.49^\circ$	$+281.91^\circ$
For Conchicine	$\alpha_j = +323.06^\circ$	$+324.54^\circ$

Three experiments were made with the hydrochlorate of conchicine (anhydrous). I. in alcoholic solution; II. in aqueous solution with dilute $H Cl$; and III., in solution in strong fuming $H Cl$. The rotatory power was found to be—

	I.	II.	III.
For anhydrous hydrochlorate of conchicine	$\alpha_j = +242.68^\circ$	$+279.82^\circ$	$+231.44^\circ$
For conchicine	$\alpha_j = +270.03^\circ$	$+312.47^\circ$	$+257.52^\circ$

Quinidine.

The author has never succeeded in obtaining *Kerner's quinidine* from the cinchona barks of commerce, and believes it to be a mixture. Should its individual existence be proved, however, he would propose to give it another name to avoid confusion.

Cinchonidine.

This alkaloid, formerly known as quinidine, was first accurately described by F. L. Winckler, in 1847 (who obtained it from the bark of *C. Tucuyensis*), though it had been observed in an impure state as early as 1833, by Henry and Delondre.

The neutral hydrochlorate of cinchonidine crystallizes in monoclinic double pyramids, a form presented by no other combination of hydrochloric acid with a cinchona alkaloid. When obtained by concentrating its aqueous solution at a moderate temperature, or by cooling its supersaturated solution, this salt forms radiating silky

prisms, which, if allowed to remain in contact with the mother-liquor for some time, lose one molecule of water of crystallization, and change into the compact form.

The formula of these radiating crystals, as calculated from the author's analyses, is $C_{20}H_{24}N_2O, HCl + 2H_2O$.

Sulphate of cinchonidine, when crystallized from boiling alcohol, forms delicate white prisms, having the composition $2C_{20}H_{24}N_2O, H_2SO_4 + 2H_2O$, and corresponding therefore with the sulphate of quinine, crystallized from alcohol.

Cinchonidine turns the plane of polarized light to the left. Operating on its alcoholic solution the author found $\alpha_j = -112.49^\circ$, which agrees with Scheibler's results, but differs from those obtained by Pasteur.

Experiments made with an alcoholic solution of the anhydrous neutral sulphate gave—

	Mean of 3 determinations.
For $2C_{20}H_{24}N_2O, H_2SO_4$. . .	$\alpha_j = -153.55^\circ$
For Cinchonidine . . .	$\alpha_j = -178.47^\circ$

Sulphate of cinchonidine in aqueous solutions with one molecule and with six molecules of SO_3 gave no material difference in the deviation in the first case, and a slight decrease in the rotatory power in the second case.

The hydrochlorate with one molecule of water of crystallization in alcohol solution gave for the salt $\alpha_j = -137.66^\circ$, and for the alkaloid as neutral hydrochlorate $\alpha_j = -162^\circ$; the same salt dissolved in dilute HCl gave $\alpha_j = -141.7^\circ$ and its solution in HCl , diluted with an equal bulk of water, α_j for the salt = -143.83° , and for the alkaloid $\alpha_j = -169.29^\circ$.

The author next gives an elaborate review of the history of cinchonidine, showing that the various cinchonidines, which have been described as being different from Pasteur's cinchonidine, have no individual existence, but are mixtures of several alkaloids (chiefly cinchonine and cinchonidine).

Cinchonine.

This substance, which was first observed by Dr. Duncan, and shortly afterwards by Gomez, was shown to be a true vegetable alkaloid by Pelletier and Caventou in 1820. Its composition was represented by Pelletier and Dumas as $C_{39}H_{39}N_4O_3$, by Laurent as $C_{19}H_{11}N_2O$, and finally by Liebig and Regnault as $C_{20}H_{24}N_2O$. The barks from which cinchonine is generally prepared are those of *C. succirubra*, *C. Pitayensis*, *C. Calisaya*, *C. ovata*, and *C. lancifolia*;

it is easily obtained in a pure state, owing to its slight solubility in alcohol.

The statement made by Willm and Caventon, that "all cinchonine contained a small quantity of hydrocinchonine, which could not be separated without a complete decomposition of the cinchonine, by means of permanganate of potash," induced the author carefully to investigate this subject. His experiments lead to the conclusion that cinchonine contains no hydrocinchonine, that a small quantity of the latter is formed during the oxidation of the cinchonine, and that therefore hydrocinchonine must be looked upon as a decomposition product, and not as one of the cinchona alkaloids.

The sulphate, hydrochlorate, and oxalate of cinchonine can be obtained by boiling the pure alkaloid with an aqueous solution of $(\text{NH}_4)_2\text{SO}_4$, NH_4Cl , or $(\text{NH}_4)_2\text{C}_2\text{O}_4$, and allowing the solution to crystallize.

For the determination of the rotatory power of cinchonine, experiments were made with alcoholic solutions of the pure alkaloid, the neutral sulphate and the hydrochlorate; the mean results calculated from these experiments, were—

With the pure alkaloid $\alpha_j = +226.48^\circ$

With the neutral sulphate—

For the salt $2\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}, \text{H}_2\text{SO}_4 + 2\text{H}_2\text{O}$ $\alpha_j = +200.5^\circ$

For Cinchonine $\alpha_j = +244.12^\circ$

With the hydrochlorate—

For the salt $\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}, \text{HCl} + 2\text{H}_2\text{O}$. $\alpha_j = +164.58^\circ$

For the alkaloid $\alpha_j = +203.58^\circ$

Experiments with the sulphate with 1 mol. and with 6 mol. of SO_3 in aqueous solution, and with an aqueous solution of the hydrochlorate strongly acidulated with HCl , proved that the specific rotatory power of cinchonine is increased by sulphuric acid, to the extent of $+17.56^\circ$, for each molecule of SO_3 entering into combination, but that it is again diminished by any addition of acid beyond the highest point of saturation; further, that it is diminished in the neutral hydrochlorate, but increased by an excess of HCl .

Aricine.

This alkaloid, known also as *cinchovatine*, was discovered by Pelletier and Caventon in 1829, and was afterwards investigated by Leverkohn, Delondre, Bouchardat, Wiggers, Winckler, Manzini, Kerner, and Howard. The literature on this alkaloid and its sources reveals a great diversity of opinion, and an almost hopeless state of confusion.

The author thinks that the existence of aricine remains still an open question; his own attempts to prepare it from bark, described as containing it, were unsuccessful.

Paricine.

The discovery of this alkaloid is due to Winckler, who, in 1845, obtained it from the barks of *Buena hexandra* and *Cinchona lutea*. It has since been shown to occur not unfrequently in the East Indian *C. succirubra*. Like berberine, it can be precipitated from solutions of its salts by nitric acid; the precipitated nitrate when suspended in alcohol may be decomposed by ammonia, and its alkaloid taken up by hot petroleum ether, which upon separation and evaporation will leave it in an impure state. It may be purified by dissolving it in dilute HCl , filtering the solution through animal charcoal, and mixing the decolourized filtrate with an excess of ammonia. The flocculent yellowish white precipitate thus obtained is pure paricine. It differs from berberine by its solubility in petroleum ether, and by its lower melting point, which is 116°C ., that of berberine being 200°C . It is soluble also in water, alcohol, sulphuric acid, and acetic acid. Strong nitric acid converts it into a dark green resin, which is dissolved by heat. Its solution in acetic acid forms a yellowish white flocculent precipitate (nitrate of paricine) with HNO_3 or NaN_3 .

The author, having received from Mr. F. Jobst a quantity of paricine sufficient for an analysis, hopes soon to be able to make known its composition.

Quinamine.

Traces of this alkaloid occur with paricine and other alkaloids in some kinds of red bark. In order to obtain it, the mixed alkaloids of such barks are dissolved in dilute H_2SO_4 , the solution is neutralized by ammonia, and cinchonidine, and quinine, if present, precipitated as tartrate by tartrate of soda. The filtrate is rendered alkaline by ammonia, and shaken with ether, which takes up the quinine and the amorphous alkaloids, leaving cinchonine undissolved. The ethereal solution is allowed to evaporate slowly in a flask, when delicate, long, hair-like crystals of quinamine will be formed, which must be separated by decantation from the viscous fluid before the latter solidifies. The crystals are washed with dilute alcohol, and then dissolved in dilute HCl ; the solution is mixed with sufficient PtCl_4 to ensure complete precipita-

tion, the precipitate removed by filtration, the filtrate treated with H_2S to remove the platinum, again filtered, and this last filtrate freed from H_2S by boiling, and the alkaloid precipitated from it by means of ammonia. By recrystallizing the alkaloid from boiling weak alcohol, it is obtained in a perfectly pure state.

Cold water takes up mere traces of quinamine, boiling water takes up more, and strong alcohol, especially when boiling, dissolves it very freely. It is also soluble in boiling ether, petroleum ether, and benzine.

Although quinamine is almost tasteless, its solutions in acids have a very bitter taste. Such solutions with an excess of acid are not fluorescent. Its solution in HCl when treated with chlorine and ammonia produces a yellowish amorphous precipitate, but no green colour. Acid solutions of quinamine are very prone to decomposition, causing the formation of an amorphous alkaloid of probably the same composition as quinamine.

The author's analyses of quinamine lead to the formula $C_{20}H_{26}N_2O_2$, giving 326 as its molecular weight, which was confirmed by two analyses of its hydriodate.

A short description is given of the properties and modes of preparation of the following salts and double salts of quinamine: hydrochlorate, hydriodate, neutral sulphate, acetate, neutral tartrate, hydrochlorate of quinamine and mercury, hydriodate of quinamine and gold, hydrochlorate of quinamine and gold, and hydrochlorate of quinamine and platinum.

The rotatory power of quinamine in alcohol solution was estimated, and α_j calculated as $= +106.8^\circ$.

Paytine.

This alkaloid was discovered by the author in a white bark imported from Payta, the anatomical structure of which agrees with that of cinchona barks. The source of this bark, however, is not yet known.

Paytine, like quinamine, reduces solution of gold, and forms a hydriodate which is but little soluble in water. Its rotatory power in alcoholic solution is represented by $\alpha_j = -49.5^\circ$. Its formula is $C_{21}H_{24}N_2O_2$.

The Amorphous Bases.

Cinchona barks contain a variable amount of amorphous substance, the quality of which depends upon the nature of the alkaloids which normally occur in the respective barks. These

substances may therefore be regarded as decomposition products of the true cinchona alkaloids, the more so as they can be artificially prepared from the latter, and are frequently formed from them contrary to all intention, during their preparation.

Whether or not the amorphous bases produce a green coloration with chlorine and ammonia depends solely upon the formation or non-formation of this green coloration by the crystallizable alkaloids which accompany them. In the former case, the amorphous substance may be said to consist of quinicine; in the latter, of cinchonicine. But if the bark contain at the same time quinine and cinchonidine or conchicine and cinchonine, we may be sure that the amorphous substance is a mixture, which in some instances, as in the bark of *C. succirubra*, may also contain traces of paricine and amorphous quinamine.

In the author's opinion, the influence of the light in the formation of these amorphous modifications of the cinchona alkaloids has been overrated; for the alkaloids and their salts in the dry state, or as contained in the barks, suffer but a trifling change even if exposed to sunlight for a long time, and the amorphous substances produced by the action of sunlight upon acid solutions of the alkaloids are not met with in cinchona barks.

That the amorphous bases are formed in the manufacture of sulphate of quinine, and remain in the mother-liquor, is well known. Quinicine was obtained from this mother-liquor by David Howard, who then supposed it to be a new alkaloid. If, therefore, quinicine be found in the working up of barks containing quinine, the formation of cinchonicine may reasonably be supposed to result from the employment of barks containing cinchonine and cinchonidine.

Pasteur has shown that the crystallizable cinchona bases, when heated with acids for some time, are converted into these amorphous modifications; quinine and cinchonidine are thus converted into quinicine and cinchonicine respectively, whereby their specific rotatory power is diminished. These modifications are, moreover, formed too without the addition of acids, as for instance by heating the bases with glycerin to 183–210° C.

In concluding his elaborate essay, the author reminds his readers that, leaving the amorphous bases and the doubtful aricine and quinidine out of consideration, the only cinchona alkaloids the existence of which has been fully established are quinine, cinchonidine, cinchonine, paricine, quinamine, paytine, and conchicine. Of

these the first three are well known articles of commerce. Conchicine is generally met with under the name of "quinidine." Quinamine, paytine, and conchinine, appear to form a group together, and to be capable of being converted one into another under the influence of vegetable life, a supposition which would explain the fact that the bark of *C. succirubra* contains quinamine but no conchinine.

The Separation of the Mixed Alkaloids from Cinchona Barks.
Dr. J. E. de Vrij. (*Pharm. Journ.*, 3rd series, iv., 241.) Twenty grammes of powdered sifted bark, dried at 100° C., are mixed with milk of lime, made of 5 grammes of dry slaked lime and 50 grammes of water. The mixture is slowly dried, and when entirely dry, heated in a flask with 200 cubic centimetres of very strong spirit (the strongest possible) till it boils. After cooling and subsiding, the clear liquid is poured on a filter large enough to contain all the bark, but not larger than is strictly necessary (a filter of 15 centimetres diameter is sufficient). The residue in the flask is now mixed again with 100 cubic centimetres of spirit, this mixture well shaken, and poured on the filter. When all the liquid has passed through the filter, the powder remaining on the filter is washed with 100 cubic centimetres of alcohol, so that in the whole 400 cubic centimetres of alcohol are used for twenty grammes of bark. The united liquors are now slightly acidulated with weak sulphuric acid, whereby a precipitate of sulphate of lime is formed. After this has subsided the greater part of the liquor can be poured off, the rest being filtered through a small filter. The clear liquid is now distilled to obtain the greater part of the spirit used, and the remaining liquid poured into a capsule, to which is added the spirit and the water by which the distilling apparatus is subsequently washed. The capsule is now heated on a water-bath till all the spirit has been expelled, and the remaining liquor, which contains all the alkaloids in the form of acid sulphates, is, after cooling, filtered through a small filter. On the filter remains a mixture of quinovic acid and fatty substances, which must be washed repeatedly with water slightly acidulated by sulphuric acid till caustic soda no longer produces any turbidity in the passing liquid. The filtrate is now reduced to a small volume by heating on a water-bath, and while *still warm* precipitated by a slight excess of caustic soda. The benefit derived from this kind of precipitation is that the alkaloids precipitated from a warm solution are less voluminous, and can, therefore, more easily be washed. The drawback, however, is that the alkaloids from some barks melt under these circumstances, which

drawback can, however, easily be rectified by carefully powdering the alkaloids after the cooling of the liquor, and collecting this powder on a small filter. After washing with the smallest possible quantity of distilled water, sufficient to remove the soda salt but not to dissolve quinine, the filter is laid upon blotting paper, and this so often renewed till the mixed alkaloids can easily be separated from the filter without adhering to it, which can be done before they are entirely dry, but requires some practice. They are then heated in a weighed capsule on the water-bath, till repeated weighings show that the weight remains constant. The observed weight multiplied by five gives the amount of mixed alkaloids in 100 parts of bark.

The amount of quinovic acid can be ascertained in the meantime, if the mixture of quinovic acid and fatty substances be treated with a weak solution of caustic soda, by which a great part of this mixture is dissolved. If to this turbid solution a slight excess of chloride of calcium is added, only the quinovate of lime remains in solution, and can be obtained in the shape of a clear slightly-coloured liquid by simple filtration. If this clear liquid be acidulated by hydrochloric acid, the quinovic acid is precipitated in the shape of a voluminous jelly. As the amount of quinovic acid is generally very small, its quantity can rarely be ascertained with accuracy, unless the amount of bark be not under forty grammes. As I generally make two analyses of twenty grammes of bark, I combine the mixture of quinovic acid, etc., of the two filters for the determination of the quinovic acid.

The Amorphous Alkaloid in Cinchona Barks. Dr. J. E. de Vrij. (*Pharm. Journ.*, 3rd series, iv., 589.) Whilst the quinologists agree on the existence of an amorphous alkaloid in cinchona barks, they differ widely in their opinion as to its real nature. Dr. O. Hesse contends that the amorphous substance in question is either cinchonine or quinicine, a statement which is doubted by Mr. D. Howard, because the compounds of the amorphous substance with acids cannot be crystallized, whereas salts of quinicine can be obtained in a crystalline form.

The author has always felt convinced that the amorphous alkaline substance obtained from cinchona barks is not identical with those products of the modification of quinine, quinidine, cinchonine, and cinchonidine, called by Pasteur quinicine and cinchonine. His opinion on this point derived some further support from Mr. Howard's researches. Dr. Hesse's statement of the great solubility of sulphate of quinidine in chloroform induced the author to try the

action of this solvent on the oxalates of quinine and cinchonine, and on the oxalate of an amorphous alkaloid, soluble in ether, obtained from Indian bark. These preparations were dried on a water-bath before subjecting them to the action of chloroform. The results were very striking, as the action of chloroform on these three oxalates proved to be very different.

The oxalate of quinine was sparingly soluble at the ordinary temperature, but dissolved freely at a temperature of 61°C . The solution in cooling deposited the greater part of the oxalate in crystals. It would be interesting to investigate whether these crystals contain chloroform in chemical combination.

The oxalate of cinchonine dissolved freely at the ordinary temperature. By adding a few drops of water on the surface, the solution was transformed within a few minutes into a solid mass.

The oxalate of the amorphous alkaloid dissolved in the largest quantity at the ordinary temperature. By adding a few drops of water on the surface, the solution remained limpid, but the water attracted a part of the oxalate from the chloroformic solution.

Besides these facts, the dried oxalates behave quite differently on exposure to the air. Those of quinine and cinchonine remain unaltered, but the other oxalate attracts moisture. This hygroscopic character is a property of all the compounds of the amorphous alkaloid hitherto investigated by the author, viz., the sulphate, hydrochlorate, acetate, oxalate, and sulphocyanate. All these compounds, with the exception of the sulphocyanate, are soluble in all proportions of water, and if they are as pure as possible, these very concentrated solutions, which have an alkaline reaction on red litmus paper, retain their limpidity, even if they are mixed with a large quantity of distilled water. These facts confirm the author's previous conviction, and he therefore adheres to his opinion that Dr. Sartürner was right when about half a century ago he described, under the name of chinoidine, an amorphous alkaloid *sui generis*, discovered by him in the bark of *C. Calisaya*.

If this and other cinchona barks contain an amorphous alkaloid, of which the compounds with acids are equally amorphous, it is clear that it must accumulate in the mother-liquors of the quinine manufactures, so that the quinoidine precipitated from these mother-liquors by an alkali must contain Sartürner's amorphous alkaloid, contaminated with other substances whose real nature is still unknown. There is reason to suppose that the amorphous alkaloid in question is easily decomposed, so that it is very possible that the

substances by which it is accompanied in the quinoidine of commerce are partially the products of this decomposition.

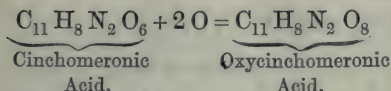
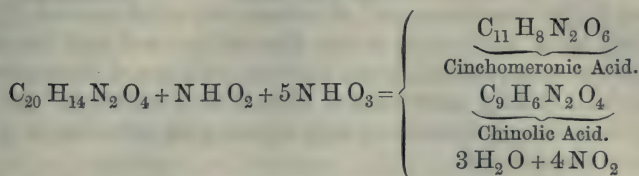
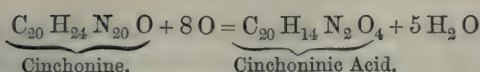
On Quinamine. Dr. J. E. de Vrij. (*Pharm. Journ.*, 3rd series, iv., 609.) The author has discovered a new process for the preparation of this new alkaloid, which is much more simple than that proposed by Dr. Hesse (*Annalen der Chemie und Pharmacie*, clxvi., 267). He proceeds in the following manner:—

The mixed alkaloids obtained from the red bark are converted into neutral sulphates, and the solution treated with Rochelle salt, whereby the tartrates of quinine and of cinchonidine are separated. After collecting these upon a filter, the filtered liquor is shaken with caustic soda and ether. By this process the amorphous alkaloid and the quinamine are dissolved by the ether with slight traces of cinchonine, whilst the bulk of this last alkaloid remains undissolved. After distilling the ethereal solution the residue is transformed into neutral acetate, and the solution of this mixed with a solution of sulphocyanate of potassium. By this reagent the sulphocyanate of the amorphous alkaloid is precipitated in the shape of a yellow, soft, resinous substance, whilst the sulphocyanate of quinamine remains dissolved. After subsiding and filtering, the solution is clear and quite colourless, and by addition of caustic soda the quinamine is precipitated. It is then collected upon a filter, washed, and dried. It can now easily be obtained crystallized by dissolving it in boiling spirit, from which it crystallizes in cooling. By this process the author obtained 0.38 per cent. of pure quinamine from samples of red cinchona quill bark, which he had received through the Secretary of State for India, from the plantations in British Sikhim.

The Oxidation Products of Cinchonine. Dr. Weidel. (*Pharm. Journ.*, 3rd series, iv., 957.) (*Berichte der kaiserlichen Akademie der Wissenschaften in Wien*, 1874, 78.)

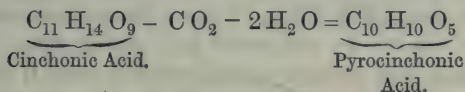
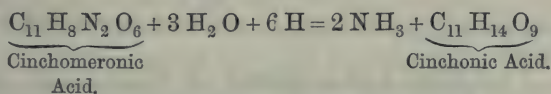
The author had previously found that by the oxidation of nicotine with nitric acid, nicotinic acid, a well-crystallized and characteristic acid, is formed. He was therefore induced to test chinoline in this respect, and was able to establish that it also yielded a similar acid. After this the cinchonine from which the chinoline had been prepared was tried, in the hope of throwing some light upon the constitution of that and similar vegetable bases, the so-called alkaloids.

In the first place the oxidation of cinchonine by means of nitric acid yielded four acids, the formation of which can be represented by the following equations:—

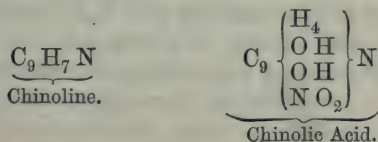


All these acids are well crystallized and definite compounds, the formulæ of which have been controlled by the analysis of several of their salts. It required a series of tedious experiments to isolate the oxidation products from the crude mixture and to purify them.

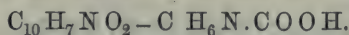
The most interesting of these four acids is the cinchomeronic acid, which is distinguished by the fact that by treating it with nascent hydrogen it can be converted into a strong non-nitrogenous tribasic acid, which in its turn can be entirely decomposed by dry distillation into a crystallizable pyro-product, carbonic acid and water.



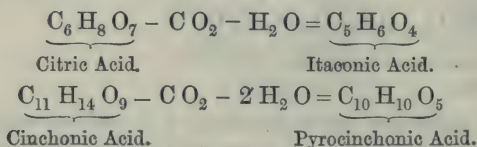
Chinolic acid, the decomposition product of cinchonine, second in importance, has been recognized as a derivative of chinoline. It contains an atom of nitrogen in the form of N O_2 .



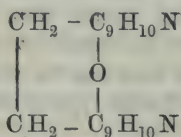
Cinchoninic acid is formed from cinchonine by the displacement of eight atoms of hydrogen by four of oxygen; it is possibly the carboxyl derivative of chinoline if its formula may be halved:—



If at present it be not possible from this fact to settle the constitutional formula of cinchonine, it is manifest therefrom that neither is the constitution of chinoline, the chief product of the splitting up of cinchonine, nearer elucidation; and that the non-nitrogenous acid obtained, is not identical with any of the vegetable acids which it may resemble, nor with their derivatives. Its decomposition into pyrocinchonic acid, is analogous with that of citric acid into itaconic acid.



Provisionally, therefore, we must be contented with a hypothetical formula for cinchonine, and as such, and one, moreover, that will serve to suggest further experiments, Dr. Weidel suggests—

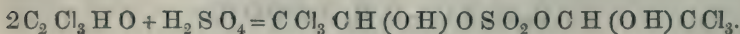


This formula serves also to explain the facts ascertained in former investigations.

Action of Sulphuric Acid on Chloral. J. Grabowski. (*Berichte der deut. chem. Ges.*, 1873, 225.) It has hitherto been assumed that chloral is not altered by sulphuric acid acting upon it at a low temperature, and that an insoluble chloral is formed if the action is allowed to proceed for some time. It has also been stated that chloral becomes converted into chloralide by the action of sulphuric acid or of fuming sulphuric acid at a higher temperature.

The chemists who have studied this reaction appear to have overlooked the fact that chloral combines with $\text{H}_2\text{S O}_4$ with great facility. In mixing chloral with fuming sulphuric acid (as Kekule recommends for the preparation of chloralide), it is observed that after a short time the mixture solidifies, forming a white mass of large crystals, which is neither insoluble chloral nor chloralide, but a compound of chloral and sulphuric acid.

The analysis of this compound led to the formula $\text{C}_8\text{H}_6\text{Cl}_{12}\text{O}_{11}\text{S}_2$, which corresponds to an anhydride of the neutral sulphate of chloral.



Supposing that two molecules of this body lose one molecule of water, we arrive at the notation $C_8H_6Cl_{12}S_2O_{11}$.

This compound is not affected by cold water, but is readily split up by hot water or by solution of KHO into chloral and H_2SO_4 . It is very soluble in alcohol, but not without suffering decomposition, forming H_2SO_4 and chloral alcoholate. From its ethereal solution it crystallizes unchanged in needles. When heated it becomes liquid, and separates into two strata, which appear to be H_2SO_4 and chloral; if heated further HCl is given off and the upper stratum is converted into chloralide, which solidifies on cooling.

If the vapours of fuming sulphuric acid are passed into chloral, a solid mass of needle shaped crystals is formed, which is likewise a compound of H_2SO_4 and chloral, though it differs from the one previously described. It crystallizes from its solution in alcohol without decomposing, and forms two separate layers on heating; at a higher temperature HCl is evolved, and an oil remains, which does not solidify on cooling, and is not altered by water. This compound contains 53.33 per cent. of chlorine and 9.33 per cent. of sulphur, but its exact composition has not been ascertained yet.

Prevention of Explosions in Working with Hydrogen. R. Fresenius. (*Zeitschrift f. Analyt. Chem.*, 1873, 73.) The explosions which frequently occur in igniting hydrogen are rendered impossible by a slight modification of the apparatus. Connect the tube into which the hydrogen passes from the washing bottle with another tube, containing several pieces of wire gauze pressed between cotton wool. This simple arrangement has been adopted in the author's laboratory with perfect success.

The Direct Synthesis of Ammonia. By W. F. Donken. (*Amer. Journ. Pharm.*, 4th series, iii., 368.) The action of induced electricity on mixtures of certain gases has been lately shown by Sir Benjamin Brodie to yield very interesting results. (*Pharm. Journ.*, 3rd series, iii., 136 and 156).

An obvious application of his method was to treat a mixture of dry hydrogen and nitrogen in a similar manner as those referred to above, with the view of effecting the synthesis of ammonia; and Sir B. Brodie kindly allowed the author the use of his apparatus for the purpose of the experiment, which was conducted as follows:—

A mixture of about three volumes of hydrogen with one of nitrogen in a bell-jar over water, was passed through two tubes containing pumice moistened with alkaline pyrogallate and sulphuric acid respectively, then through a Siemen's induction-tube, and into a.

bulb containing dilute hydrochloric acid. The whole apparatus being first filled with pure hydrogen, about half a litre of the mixed gases was sent through the apparatus, the induction coil not being in action; the bulb containing the acid was then removed, and another substituted, containing an equal volume of the same acid.

About half a litre of the mixed gases was now passed through the apparatus, submitting them to the action of the electricity. The contents of the two bulbs were next transferred to two test-tubes; and after adding excess of potash to each, Nessler's test was applied. The first solution gave a faint yellow coloration, the second a rather thick reddish brown precipitate.

No attempt was made to estimate the quantity of ammonia formed, as it would vary with many of the conditions of the experiment.

Messrs. Thénard of Paris have also observed the formation of traces of ammonia by the action of electricity on a mixture of hydrogen and nitrogen, but have given no details as to the mode of operation.

Detection and Estimation of Phosphorus in Fatty Mixtures. By D. A. van Bastelaer. (*Journ. de Pharm. d'Anvers*, 1872, 433.) For detecting and estimating free phosphorus in articles of food, vomits, and other fatty substances, the author recommends the following method, which he has successfully employed in several forensic investigations. His method is based mainly upon the solubility of phosphorus in ether, and its indifference to solution of ammonia during a short contact. If the substance under examination is not a liquid, sufficient water must be added to convert it into a very thin paste. Both the original substance and the water added must be weighed. 100 grammes of the liquid or semi-liquid substance are now mixed with an equal quantity of ether, and kept in contact with it for four or five hours, during which the mixture is to be shaken frequently. The ether is then separated by decantation, and replaced by a fresh quantity of ether, which operation is repeated three times. The united ethereal solutions are allowed to evaporate spontaneously in a shallow dish at 15° – 20° C., and a little water is added during the evaporation in order to protect the phosphorus from contact with the air. As soon as the ether has all been driven off, the residue is gently heated to 50° – 60° , when the phosphorus will unite under water with a part of the fat, forming a little globule, while the other substances dissolved by the ether will separate out on the surface. The globule is to be shaken in a flask with 10–15 grammes of strong solution of ammonia, and this process

repeated several times. The adhering ammonia is then removed by washing, first with water slightly acidulated with H_2SO_4 , and afterwards with pure water, when the phosphorus will be left in an almost pure state, in which it may be weighed and produced at court.

A New Apparatus for Generating Oxygen. By W. Hildwein. (*Pharm. Centralhalle*, xiv., 318.) As oxygen gas is now frequently applied in hospitals for inhalations, etc., and as the ordinary mode of preparing it proves very troublesome and even dangerous to the hospital attendants on account of the frequent bursting of the retorts, M. Limousin has constructed an apparatus which is as safe in its application as it is convenient. The apparatus consists of two cast-iron hemispheres, whose edges, which are well polished and about two centimetres thick, can be fitted hermetically upon each other, and fastened by three screws.

The mixture of KClO_3 and MnO_2 is placed in the lower hemisphere, which rests upon a tripod; the upper hemisphere, from which projects an iron tube, is now screwed on, and the iron tube connected by indiarubber and glass tubing with a Wolf's wash-bottle, from which the gas, after being washed, passes through a second glass tube, and is thus ready for use. It may be conducted into an air-tight bag, in which it will keep for several weeks. Such a bag, when supplied with a tube and stopcock, will afford a ready means for inhalations.

Carbolic Acid and Creasote. By A. M. Read. (*Amer. Journ. Pharm.*, 4th series, vii., 291.) The author, after describing the manufacture and general properties of carbolic acid, refers at some length to the various tests for distinguishing creasote from carbolic acid, and says:—

There have been a great many tests given to distinguish creasote from carbolic acid; but none of them have proved satisfactory. I give below some of the principal ones used for that purpose.

With three or four volumes of a saturated aqueous solution of baryta, carbolic acid forms a clear solution, which after standing, gives no deposit, or only a slight pulverulent one, while with creasote it forms an incomplete cloudy solution.

With an alcoholic solution of chloride of iron, creasote gives a green colour, carbolic acid a brown; but with an aqueous solution of the same, creasote gives no reaction, while carbolic acid gives a blue colour.

According to Mr. Morson, pure creasote is insoluble in glycerin, while carbolic acid forms with it a perfectly clear solution. As this test has been the subject of some controversy which has attracted

considerable attention, I have made a few experiments with it, the results of which I give below.

I first tried the common creasote of commerce with an equal volume of glycerin, and found it to be readily soluble: Merck's gave the same result, but Morson's refused to dissolve in glycerin, of specific gravity 1.253, even after three or four volumes had been added.

I then carefully added carbolic acid to a mixture of Morson's creasote and glycerin, and found that upon the addition of 23 per cent. of Calvert's No. 2 acid the creasote became soluble, forming a perfectly clear solution with the glycerin.

Upon the addition of water to the three solutions of creasote, they each became cloudy, and the creasote soon separated; while, upon a solution of carbolic acid in glycerin, water had no effect whatever.

Some time ago, while preparing a catarrh mixture in which carbolic acid is used in conjunction with liquor ammoniæ fortior, alcohol, and water, I found that upon the addition of the ammonia to the acid, the acid was readily dissolved, forming a clear solution, which did not change upon the addition of the other ingredients; but which, after standing a few hours, became a beautiful violet-blue colour. Having been taught by text-books that carbolic acid was insoluble in ammonia, I was somewhat surprised at this result, and upon referring to Watt, Gmelin, and other authorities, and finding that they made the same statement, my surprise was somewhat intensified. I immediately instituted a series of experiments, and found that carbolic acid was certainly soluble in ammonia, but whether owing to impurities present I could not say. I used Calvert's No. 2 acid, which was immediately dissolved by the ammonia, forming a clear solution, which, upon standing about six hours, gave the violet-blue colour spoken of above, the acid still remaining in solution, and giving no precipitate.

I then tried the ammonia upon common creasote, which I found to be insoluble in it, but which, after a short time, acquired a light blue colour.

To carry these experiments to a successful issue, it became necessary to produce chemically pure carbolic acid and creasote. After a number of attempts I succeeded in getting Morson's and Merck's creasote, and having in the meantime found in the *Druggists' Circular* a process for purifying carbolic acid, which, with some modifications, I have used, I have succeeded, I think, in confirming my first experiments.

I will give the process of purification as used by myself.

I put into a pint flask one ounce of Calvert's No. 1 acid, crystallized, and gradually added ten ounces of distilled water, shaking it frequently, when I found that six and a half drachms of the acid were dissolved, leaving one and a half drachm undissolved to contain the impurities, which are less soluble than the acid. As soon as the solution became clear, I carefully poured it off, placed it in a hydrometer glass, and added, with constant agitation, finely powdered salt (previously purified by dissolving it in water, filtering the solution, and evaporating to dryness), until the water was saturated and the acid rose to the top. I then carefully removed the acid with a pipette. Upon the addition of ammonia to this product, it was very readily dissolved; but it did not give the violet-blue colour until after standing about twelve hours. Not being satisfied, I repurified it in the same way, being careful not to add as much water as I did at first.

The addition of an equal volume of ammonia to this product of repurification quickly dissolved it, forming a perfectly clear solution, which did not acquire the violet colour until after standing nearly thirty hours.

For want of time I was not able to carry out the purification by fractional distillation, as I should like to have done; still I consider the product of repurification very nearly pure, much purer at least than any I could find in the market.

Upon the addition of ammonia to this acid, as stated above, it was readily dissolved; while upon Morson's creasote, ammonia had no effect whatever, neither dissolving it, nor giving it the blue colour that it gave to the common creasote. Merck's creasote gave the same result; it, as well as other samples that I have tried, being perfectly insoluble in ammonia.

The ammonia used in the experiments given above was the aqua ammoniæ fortior of the U.S.P., sp. gr. 0.900. The aqua ammoniæ, U.S.P., sp. gr. 0.960, would answer the same purpose, but a much larger proportion would be required.

After the successful termination of the experiments given above, the author has no hesitation in suggesting aqua ammoniæ fortior as a test to distinguish between carbolic acid and creasote, and in leaving its value, as compared to other tests now known, to the judgment of the pharmacist and chemist.

Old and New Reagents for Common Phenol. Egidio Polacci. (*Chemical News*, May 8th; from *Gaz. Chim. ital.*, 1874.)

The author points out the distinctions between the blue colour

produced by phenol and hydrochloric acid with a chip of fir-wood, and that given by hydrochloric acid alone. The violet coloration given by perchloride of iron is indecisive, as being common to all the phenols. The blue coloration given by the successive action of ammonia and a hypochlorite is less general. As this method turns on the conversion of the phenol into anilin by the action of ammonia, the test is only available where the absence of anilin is satisfactorily demonstrated. Cresylic acid and thymol yield similar results. In complex organic fluids the reaction may fail. The conversion of phenol into picric acid by the action of nitric acid cannot be used for the detection of the first mentioned body, since the same result is obtained with a great variety of bodies. The author pours into a narrow test-tube concentrated sulphuric acid, to the height of four or five centimetres, and adds cautiously the aqueous solution containing the phenol, in such a manner that the two liquids may not mix. A formation of three colours is soon perceived at the line of contact of the two liquids. These three are soon reduced to one, a vermilion red, which, setting out from the plane of division, diffuses itself through the entire mass of the phenol solution. This colour is stable, and remains unaltered for months. If the red liquid is removed from the acid, and treated with an alkali, it becomes yellow without losing its transparency. This reaction serves to detect one part of phenol in about 2000 of water. Another method is as follows:—In a well glazed porcelain crucible is put a little of the most concentrated sulphuric acid, to which is added a relatively minute portion of bichromate of potash. The mixture is well stirred, so that the liberated chromic acid may be uniformly distributed through the sulphuric acid. A small drop of the liquid under examination is placed upon the acid mixture, which immediately gives a brown coloration at the point of contact. If the proportion of phenol is larger than one part in 30,000 the coloration is accompanied with a chocolate-brown precipitate. The author has also examined Landolt's test, which consists in adding to the suspected solution bromine water in slight excess. If phenol is present a yellowish-white precipitate is produced. The sensibility of this reaction extends to one part in 45,500. As Landolt has remarked, precipitates more or less similar are produced by oxybenzoic acid, the homologues of phenic acid, anilin, toluidin, quinia, quinidine, cinchonine, strychnia, narcotine, and morphia. The author considers that the yellowish white precipitate may be recognized as tribromo-phenol by the following reactions:—It has a special odour, slightly recalling

that of the hydride of salicylic acid. It is insoluble in acids, but soluble in alkalis, ether, and absolute alcohol. A very small quantity of water completely separates tribromo-phenol from its alcoholic solution. If carefully heated on platinum foil it may be volatilized unchanged without leaving a residue. But if the heat is strong the compound is decomposed and burns with a smoky flame, evolving much bromine, and leaving a carbonaceous residue. A portion placed in a porcelain capsule, and treated with sulphuric acid and bichromate of potash, produces a chocolate-brown colour, with the escape of bromine vapours. If the bichromate is dissolved in water, and the experiment conducted in a glass tube, with the application of heat, the liquid takes a fine green colour. If gently heated with nitre and concentrated sulphuric acid it forms oily drops of a fine red colour, which burn, leaving a bulky carbonaceous residue.

Toxicological Detection of Carbolic Acid. E. Jacquemin. (*Pharm. Journ.*, 3rd series, iv., 851; from *Rép. de Pharm.*, ii., 429.) The author examines the various methods proposed for the detection of this substance, and suggests certain modifications in each case. It has been recommended to distil liquid or solid organic matters—urine, blood, or organs rich in blood—with a little sulphuric or phosphoric acid. If the distillate presents the characteristic odour, it is to be shaken with ether, the decanted liquor left to evaporate spontaneously, and the residue tested with the usual reagents.

When no information exists respecting the cause of the accident under investigation, the author recommends the method published by M. Dragendorff, of Dorpat. The matter, after perfect division, is suspended in sufficient distilled water to render the mass very fluid; ten parts of dilute sulphuric acid are then added to one hundred parts of the mixture, and the whole allowed to digest for several hours at 50° C.; then expressed, and again treated with an equal quantity of acidulated distilled water. The liquors, mixed and filtered, are evaporated to a slightly syrupy consistence; to the residue is added three or four times its volume of alcohol, which is allowed to digest for twenty-four hours, filtered, and the filter washed with 70° alcohol. The alcoholic liquor being distilled leaves in the retort an aqueous liquor, which is filtered after cooling into a large flask, where it is agitated at the ordinary temperature with rectified petroleum spirit, boiling at 50° C. The petroleum having been decanted, the treatment is repeated, and the petroleum is afterwards left to evaporate in a certain number of watch-glasses.

The odour of the residue, and the property of blanching the

skin, and of precipitating albumen and gelatine, belongs equally to creasote and to the cresylic phenol, as also does that of colouring blue a deal shaving exposed to the air after being plunged into hydrochloric acid. Some caution, however, is necessary in using this latter test, as M. Ritter states that he has seen a chip of deal coloured blue or green by the action of hydrochloric acid alone. Bromine water, which precipitates carbolic acid yellowish white from very dilute solutions, is a delicate test; but although the precipitate which is obtained very slowly in dilute solutions takes a crystalline structure, the reaction is rather a supplementary than a characteristic one. Neither is the conversion of carbolic acid into picric acid by nitric acid a characteristic test, although a very delicate one, for other substances yield a similar result. The property possessed by the ferric salts of colouring carbolic acid blue is a characteristic reaction, and sufficiently delicate when the phenol has been separated in the manner indicated above; for, according to Dragendorff, ferric sulphate colours lilac a solution of half a milligram to the cubic centimetre.

The reaction discovered by the author, and which is the object of his paper, depends upon the extreme facility with which carbolic acid can be converted into erythrophenate of soda, a blue salt possessing a very considerable colouring power. He has found that upon adding to carbolic acid an equal weight of aniline and then of hypochlorite of soda, a deep blue solution of erythrophenate of soda is produced, remarkable for the purity and persistence of its colour. This blue colour is changed to red under the influence of acids, in consequence of the setting free of the erythrophenic acid, the blue reappearing when the acid is saturated by an alkali. The same result is obtained with hypochlorite of lime, but less clearly, a slight turbidity being produced. A single drop of carbolic acid, treated with a single drop of aniline, and afterwards with hypochlorite of soda, gives a very deep blue liquid. If the same quantity be added to two litres of water, after a minute the blue colour begins to appear, and so increases in intensity in an hour or two that after further dilution with two fresh litres of water the colour is still marked. This the author estimates as being equal to about 1 part in 66,000. The extreme delicacy of this test has enabled the author to simplify the methods of proceeding for the detection of carbolic acid, especially as the presence of organic matters, such as alcohol, soap, fatty matters, etc., provided they are colourless, does not interfere with the working of the test.

Detection of Carbolic Acid in Blood.—In a case where it might be

necessary that the blood of a patient treated internally or externally with carbolic acid, should be examined for its presence, the author recommends that 100 grams of the blood be allowed to run from the vein into a warm tared capsule, and mixed well with an equal quantity of water containing two per cent. of sulphuric acid. But if the blood be received in a coagulated state, it is necessary to rub it up in a porcelain mortar with a little sand to break up the fibrinous network, and afterwards mix it with the acid. After an hour's contact it is thrown upon moistened calico to strain; the albumenoid matters that pass through first cling to the bottom of the vessel, and allow of the decantation of the greater part of the liquid. To this is added its own volume of 95° alcohol, and it is again filtered. When about 30 c.c. have been collected, the acidity is neutralized by carbonate of soda; by means of a glass rod a fraction of a drop of aniline is added, and finally the solution of hypochlorite of soda. If carbolic acid be present, the liquid, upon being shaken quickly, becomes green, passing to greenish blue.

In operating upon the heart, lungs, liver, or other organs or muscular tissue, about 100 grams should be cut up as small as possible, and the division completed by trituration in a mortar with clean sand. The process is commenced as in the previous case, but the residue left on the strainer is pressed, and then treated afresh with half the previous weight of acidulated water. After an hour's contact it is again strained, pressed, and the combined liquors added to their volume of 90° alcohol, allowed to stand several hours, and filtered through paper. The next day the alcoholic liquid is evaporated in a water-bath in a retort furnished with a receiver; and if, after the alcohol has passed over, the liquid be a little turbid, it is filtered into a stoppered flask.

If the preliminary test show the presence of carbolic acid, ether is poured into the flask, well shaken, and after separation the ethereal layer is decanted, and the operation repeated with a fresh quantity of ether. The spontaneous evaporation of the ether leaves the carbolic acid in a concentrated state that allows of testing by all the known reagents, and the preservation of a portion of a drop to be used if necessary in evidence. If, however, the liquor be acid, it is necessary to saturate with carbonate of soda in order to be able to produce the blue reaction of erythrophenate of soda.

If the preliminary experiment give a negative result, the author recommends that ether be replaced by a petroleum spirit, boiling at 60°; or, still failing, that benzine be used.

Detection of Carbolic Acid in Urine.—About 200 grams of urine

are treated with 4 grams of sulphuric acid, previously diluted with 16 grams of water, and maintained during one hour at a temperature of 50°C . When cool an equal volume of alcohol is added, and after standing some time the mixture is filtered, and treated as indicated above.

Detection of Carbolic Acid in Milk.—230 grams of milk, after the addition of the dilute sulphuric acid, as above, are heated and kept at a temperature near to boiling until the casein has entirely separated. The liquid is allowed to cool, filtered, treated with alcohol, etc., as in the foregoing.

The author had occasion to examine the milk of a cow which, having been severely wounded at pasture, had the wound dressed with carbolic acid. He states that a single drop of aniline and the hypochlorite added directly to the milk was sufficient to produce the blue coloration of erythrophenate of soda in the course of one minute.

Quantitative Determination of Emetine, Aconitine, and Nicotine.

O. Zinoffsky. (*Journ. de Pharm. d'Anvers*, xxix., 490 ; from *Rép. de Pharm.*) In order to make a quantitative determination of *emetine*, treat 15 grams of powdered ipecacuanha with alcohol of 85 per cent. acidified with a few drops of sulphuric acid, so as to form a volume of 150 cubic centimetres. Filter, and after expelling the alcohol from 100 cubic centimetres of the liquid by distillation, add to the residue a tetrated solution of iodo-hydrargyrate of potassium until a filtered portion ceases to be affected by this reagent. The number of cubic centimetres of iodo-hydrargyrate, multiplied by 0.0189 (0.0001 of the equivalent of emetine), gives the quantity of emetine contained in 10 grams of the root. A normal solution of iodo-hydrargyrate is obtained by mixing aqueous solutions of 13.546 grams of bichloride of mercury, and of 49.8 grams of iodide of potassium, adding water to make one litre. One cubic centimetre of this solution precipitates 0.0001, or 0.00005 of an equivalent of alkaloid.

Wine of ipecacuanha can be tetrated by the same process. Aconitine is estimated in the same way ; the number of cubic centimetres of iodo-hydrargyrate required to precipitate the alkaloid is multiplied by the number $0.02665 = 0.00005$ of an equivalent.

To estimate *nicotine*, weigh out 15 grams of tobacco, digest for twenty-four hours with alcohol of 85 per cent. acidified with 15 drops of sulphuric acid, so as to make 150 cubic centimetres. Evaporate 50 cubic centimetres of the filtered liquid, and add iodo-hydrargyrate of potassium to the residue. The number of cubic

centimetres employed, multiplied by 0.00405 (0.0001 of the equivalent of nicotine), gives the quantity of alkaloid contained in five grams of tobacco.

A Revolution in the Manufacture of Carbonate of Soda. Dr. Rudolph Wagner. (*Journ. of Applied Chemistry; Ber. deut. chem. Ges.*, vi., 1161; also *Neues Jahr. d. Pharm.*, xi., 146.) Six years ago, when the international jury at the Paris Exposition expressed their opinion upon the state of the soda industry at that time, all the judges, whether practical or theoretical men, believed that Leblanc's process would hold the field for a long time yet. This seemed still more probable since a process had just been introduced for recovering the sulphur from the soda residues. At that time, all the soda in use was prepared by this process, excepting a comparatively small amount obtained from Chili saltpetre and cryolite, although there were already tangible indications that soda could be made on a large scale by another method which would be cheaper than Leblanc's process.

The chemical section of the international jury at the Vienna Exposition, under the presidency of Professor A. W. Hoffmann, constituted a congress of chemical technology. By its labours during the course of the summer, this congress of scientific men was able to authenticate the very important fact, that although Leblanc's process might in the future possess some importance for certain branches of the industry, yet in most places another soda process would be introduced in the immediate future, and entirely supersede that of Leblanc. Since the time of the Paris Exposition this new process has grown from a small germ to a strong tree.

The process in question, and which is called by Professor A. W. Hoffmann the ammonia process, is not new from either a chemical or scientific point of view. It belongs to the same class of methods as those in which oxide of lead, bicarbonate of magnesia, quick lime, alumina, silicate of alumina, oxide of chromium or fluosilicic acid, are employed to decompose chloride of sodium and convert it directly into soda or its carbonate. None of these attempts met with a success deserving of notice, although for a century past efforts have been made to render them practically operative. The new process is founded upon a reaction noticed over thirty years ago—that of bicarbonate of ammonia upon a strong solution of common salt. The greater part of the sodium is precipitated as a bicarbonate, while chloride of ammonium remains in solution, from which the ammonia for a second operation is expelled by quicklime. The carbonic acid necessary to convert the ammonia into bicarbon-

ate of ammonia, and thus make the process a continuous one, is obtained by heating the bicarbonate of soda to convert it into the simple carbonate.

The sensation which the ammonia process has created in industrial circles will render a brief history of its development not uninteresting.

Harrison, Dyer, Grey, and Hemming, were the first to patent the ammonia process in Great Britain, in 1838. Great expectations were excited by it, but it soon sank into oblivion. Thirty or forty years ago, the manufacture of soda was by no means at the head of the great branches of industry; at that time, too, ammonia was not to be had cheaply and in immense quantities, and that branch of machine building which has furnished the necessary apparatus for chemical industries did not exist. Besides this, Anthon, of Prague, in 1840, claimed to have proved that in the ammonia process a very considerable portion of the common salt remained undecomposed.

After a sleep of sixteen years, the ammonia process again entered the field. On the 26th of May, 1854, Turck took out a patent in France, and on the 21st of June, the same year, Schloësing, chemist of the imperial tobacco factory at Paris, took out a patent for France and Great Britain. The mechanical portion and machinery for Schloësing's process were designed by Engineer E. Rolland, director of the tobacco factory. In 1855 a company was organized to work this process. An experimental manufactory was started at Puteaux, near Paris, but owing to its situation and arrangements, as well as the salt monopoly, it could not produce soda cheap enough to compete with the other process, and hence, in 1858, the experiment was abandoned. Schloësing and Rolland were of the opinion that sooner or later the new process must come into use in making soda.

It must here be noticed that in 1858 Professor Heeren, of Hanover, subjected the ammonia process to a very careful test in his laboratory. From his experiments and calculations it was ascertained that this process was better adapted to the manufacture of bicarbonate than of the simple protocarbonate of soda.

To render this sketch more complete and historically true, it must be mentioned that T. Bell, of England, took out a patent October 13, 1857, for a new soda process, which in principle and practice was almost literally the same as that of Dyer.

It was known when the jury was working at Paris in 1867, that essential improvements had been introduced into the ammonia pro-

cess by the efforts of Margueritte and De Sourdeval, of Paris, and James Young, of Glasgow. A more important fact, however, is that Solvay & Co., of Conillet, in Belgium, actually exhibited at the Paris Exposition carbonate of soda prepared by this new process.

Since that time the ammonia process has been developed and perfected to such an extent, especially by Solvay, Honigmann, and Gerstenhoefer, that as early as February, 1873, Professor A. W. Hofmann, in his introduction to the third group of the catalogue of the Exhibition of the German Empire, was able to make this remark: "At all events, the ammonia process is the only one which threatens to become an important competitor of the now almost exclusively employed process of Leblanc." The Vienna Exposition has since proved the truth of his assertion.

There are now large soda works in England, Hungary, Switzerland, Westphalia, Thuringia, and Baden, which employ the improved ammonia process, and some of them make fifteen tons of soda per day.

The advantages of the new process over that of Leblanc are very evident, although the details of the process have not yet been made public. The chief advantage consists in the direct conversion of salt into carbonate of soda, and next in the fact that from a saturated brine only the sodium is precipitated, with none of the other metals of the mother-liquor. Besides this, the product is absolutely free from all sulphur compounds, the soda is of a high grade, the apparatus and utensils are very simple, there is a great saving of labour and fuel, and no noxious gases and waste products are produced, which is of importance from a sanitary point of view. The only weak point of the ammonia process is the loss of the chlorine, which is converted into worthless chloride of calcium.

The effect which the general introduction of the new soda process will exert upon large chemical industries in general, and especially upon the consumption of sulphur, the manufacture of sulphuric acid, and the price of muriatic acid and chloride of lime, cannot be overlooked.

Scheme for the Detection of Alkaloids, etc.,

Compiled by H. Brunner. (*Zeitschr*

Taken up by Ether in Acid Solutions.*			Taken up by Ether			
			Solid			
With Tannic Acid.			With conc. H_2SO_4 .			
Precipitated.		Not Precipitated.	In the Cold.		On Heating.	
			Rose-red.	Brown-red.	First yellow, then orange and cherry-red.	First yellow, then bluish violet, and dark red.
Colchicine Solution : yellow ; conc. HNO_3 colours it violet. The nitric acid solu- tion, dilut- ed, gives an orange- red colour when ren- dered alka- line with $NaHO$.	Digitalin. Mixed with a tincture of galls and conc. H_2SO_4 , first a red zone, then a red solution are pro- duced. Dissolved in conc. H_2SO_4 , the addition of a trace of bromine water pro- duces a violet-red coloration.	Picrotox- in. The colour- less solu- tion in solution of $NaHO$ re- duces Fehling's copper so- lution.	Brucia. Soluble in conc. HNO_3 with a bright red colour, which changes into yel- low on heating. Addition to this of stannous chloride gives a bluish colora- tion.	Delphinia. With conc. H_2SO_4 and bromine water a violet-red coloration is pro- duced. The same colour is produced on evapora- tion with H_3PO_4 . — Aconitia Dissolves with a red- dish brown colour in H_2SO_4 .	Veratria Dissolves as a colour- less liquid in conc. HCl . This colourless solution becomes of a fine dark red colour on heating.	Narcotine. Its solution in H_2SO_4 becomes red on ad- dition of a trace of HNO_3 ; conc. H_2SO_4 with a trace of sodium molybdate, assumes a green tint. The solu- tion in chlorine water is greenish white, and becomes yellowish red on the addition of NH_3 .

* Small quantities of Atropia.

according to Stas-Otto's Method.

f. analyt. Chem., xiii., 72.)

in Alkaline Solutions.†

(odourless).

Liquid (strong odour).

Not taken up
by Ether,
but remaining
in the
Alkaline
Solution.

With conc.
 H_2SO_4 and $K_2Cr_2O_7$.

In the Cold.

On Heating.

With strong
 H_3PO_4
on
Heating.

With Chlorine Water.

Precipitated.

Not
Precipitated.

Bluish violet.

Flowery odour.

Strychnia.

Solution in
 HNO_3 is yel-
low; the blu-
ish violet
coloration is
also produced
by MnO_2 ,
 PbO_2 , KIO_3 ,
or
 $K_6Fe_2C_{12}$
instead of
 $K_2Cr_2O_7$.

Curarine

Resembles
strychnia in
its reactions;
but it is
reddened by
 H_2SO_4 , and
is not taken
up by ether
from acid or
alkaline solu-
tions.

Atropia.

The charac-
teristic odour
is best
developed by
placing the
alkaloid upon
a few crystals
of CrO_3 , and
applying
gentle heat
until green
 Cr_2O_3 begins
to form.

Aconitia

Produces a
violet colour.
Conc. H_2SO_4
forms with it
a light yel-
lowish brown
solution.

**Delphinia
and
Digitaline**

show the
same
behaviour
with H_3PO_4 .

Conia.

The aque-
ous
solution
becomes
coloured
upon
heating.

Dry HCl
gas turns it
first red
and then
dark blue.

Nicotin.

The aque-
ous
solution
does not
become
coloured
upon heat-
ing.

It becomes
violet when
gently
heated with
 HCl ; upon
the addi-
tion of
 HNO_3 the
violet
changes
into
orange.

Morphia.

The solution
rendered al-
kaline by
 NH_3 becomes
grass-green
on heating
with ammo-
nio-hydrate
of copper.
It turns
blood-red
with HNO_3 ,
and dark blue
with neutral
 Fe_2Cl_6 .
Dissolved in
 H_2SO_4 ,
gently heat-
ed, and after
cooling mixed
with a little
 HNO_3 , it pro-
duces an
intensely red
colour.

From iodic
acid it sepa-
rates iodine,
which forms
a violet
solution in
 CS_2 .

† Also partially Colchicine and Digitaline.

Detection of Grape-Sugar in the Presence of Dextrine and allied Bodies. C. Barfoed. (*Zeitschrift. für analyt. Chem.*, 1873, 27.) Having found the ordinary methods for detecting grape-sugar in dextrine unsatisfactory, the author obtained excellent results with a solution of cupric acetate, used instead of Fehling's solution or instead of CuSO_4 and NaHO .

A solution of neutral acetate of copper mixed with a solution of grape-sugar, and allowed to stand at an ordinary temperature, produces a red precipitate of cuprous oxide. A solution of pure dextrine treated in the same manner undergoes no change, not even after several days; but upon boiling, cuprous oxide is precipitated. Heat must therefore be avoided.

A solution of cupric acetate slightly acidified by acetic acid, if boiled for a few seconds with a solution of grape-sugar, and then allowed to stand, forms a precipitate of Cu_2O , either at once, or certainly within two hours. Pure dextrine under the same conditions does not produce the slightest reduction.

The author therefore recommends the following solution as a very good test for grape-sugar in dextrine. One part of crystallized neutral acetate of copper is dissolved in 15 parts of water, and 200 c.c. of this solution mixed with 5 c.c. of acetic acid of 1.044 sp. gr. Only a few drops of this solution should be used for each test. Operating with 0.1 gramme of dextrine dissolved in 5 c.c. of water he succeeded in detecting as little as $\frac{1}{10}$ per cent. of grape-sugar.

This test may also be used for detecting grape-sugar in cane-sugar and in sugar of milk, but the solution of sugar of milk to be tested should be weaker than the dextrine solution, as a strong solution might cause a slight reduction and precipitation of Cu_2O .

The ordinary methods for testing dextrine, viz., the treatment with Fehling's solution or with solutions of CuSO_4 and NaHO , were found by the author to be quite unreliable, as these tests produce precipitates of Cu_2O from solutions of pure dextrine unless the latter are extremely weak. But in such very weak solutions in which those tests fail to effect a reduction of CuO to Cu_2O , the percentage of grape-sugar present as an impurity would be reduced to such an extent as to render its detection hopeless.

The following tabular arrangement of the author's experiments with Fehling's solution, and with solutions of CuSO_4 and NaHO will show their effect upon solutions of pure dextrine of various strengths. The solution of CuSO_4 used in these experiments contained the same quantity of this salt as Fehling's solution (34.632 grammes in 1 litre).

I. *Solution of one part of dextrine in 15 parts of water.*

(A) 5 c.c. solution + 40 drops sulphate of copper + 40 drops of soda (1.1)—			(B) 5 c.c. solution + 40 drops of Fehling's solution.		
After 24 hours: Very considerable reduction.			Extremely strong reduction.		
" 48	"	Considerable	"	Very strong	"
" 72	"	Distinct	"	Strong	"
" 96	"	Perceptible	"	Considerable	"
" 144	"	Very weak	"	Weak	"
" 168	"	Just visible	"	Extremely weak	"

II. *Solution of one part of dextrine in 30 parts of water.*

(C) 5 c.c. solution + 20 drops sulphate of copper + 20 drops of soda.			(D) 5 c.c. solution + 20 drops of Fehling's solution.		
After 24 hours: Plain reduction.			Strong reduction.		
" 48	"	"	"	Pretty strong	"
" 72	"	Weak	"	"	"
" 96	"	Very weak	"	Weak	"
" 144	"	Nearly invisible	"	Very weak	"
" 168	"	No	"	No	"

III. *Solution of one part of dextrine in 60 parts of water.*

(E) 5 c.c. solution + 10 drops sulphate of copper + 10 drops of soda.			(F) 5 c.c. solution + 10 drops of Fehling's solution.		
After 24 hours: Very weak reduction.			Distinct reduction.		
" 48	"	No	"	"	"
" 72	"	Extremely weak	"	Weak	"
" 96	"	"	"	"	"
" 144	"	No	"	Nearly invisible	"
" 168	"	"	"	No	"

IV. *Solution of one part of dextrine in 120 parts of water.*

(G) 5 c.c. solution + 5 drops sulphate of copper + 5 drops of soda.			(H) 5 c.c. solution + 5 drops of Fehling's solution.		
After 24 hours: No reduction.			Distinct reduction.		
" 48	"	"	"	Very weak	"
" 72	"	"	"	Extremely weak	"
" 96	"	"	"	No	"
" 144	"	"	"	No	"
" 168	"	"	"	No	"

All the solutions were still coloured at the expiration of the 168 hours; A, C, E, and G being blue, B, D, F, and H being greenish.

An Examination of some Samples of Hydrocyanic Acid.

A. Towerzey. (*Pharm. Journ.*, 3rd series, iv., 509.) Twelve samples of hydrocyanic acid obtained from various sources were carefully examined by the author, with the object of ascertaining the degree of change which this preparation is liable to undergo. The following are the results of his experiments:—

So called B.P. Acid.

No. 1.	.	.	.	.	.	.	.	1.92
„ 2.	.	.	.	.	.	.	.	1.52
„ 3.	.	.	.	.	.	.	.	1.36
„ 4.	.	.	.	.	.	.	.	1.32
„ 5.	.	.	.	.	.	.	.	1.262
„ 6.	.	.	.	.	.	.	.	1.22
„ 7.	.	.	.	.	.	.	.	1.165
„ 8.	.	.	.	.	.	.	.	1.16
„ 9.	.	.	.	.	.	.	.	0.26

Acid of Scheele's strength.

„ 10.	.	.	.	.	.	.	.	3.62
„ 11.	.	.	.	.	.	.	.	4.02
„ 12.	.	.	.	.	.	.	.	1.3

The history, as far as we know, of these samples will serve to show how unfortunately unstable is this important remedy, and to indicate the necessity for special care in its management.

No. 1 was obtained from a wholesale house of deservedly good reputation, and examined *directly it arrived*.

Nos. 4 and 6 were samples of the same acid examined, in the one case when the bottle was first opened, and in the other when the contents had suffered from the frequent removal of the stopper incidental to the dispensary.

No. 3 was taken from a 40-oz. bottle, from which over 35-oz. had been from time to time removed. No. 5 was the first removal from a 40-oz. bottle, which had been in stock several months, during which time, however, the stopper had not been withdrawn. Both of these samples had been carefully preserved in bottles encased in blue paper, and kept in a cupboard in a cool underground cellar.

Nos. 2, 7, 8, and 9 were portions of the contents of dispensing bottles from different establishments.

Of the three samples of "Scheele's acid"—

No. 10 had been in stock for several months, during which time the stopper had been frequently removed.

No. 11 was a fresh sample, obtained expressly for examination; and

No. 12 was an acid of unknown birth. Its owner regarded it as a curiosity; and, like most curiosities, it is only fit to be kept on a shelf.

These results fully corroborate the statements of other authors who have investigated the same subject, and afford further evidence of the unsatisfactory condition of this acid as used in medicine. Referring to the greater stability of some cyanides, the use of which

had been suggested in place of hydrocyanic acid, Mr. Towerzey found the double cyanide of zinc and potassium to be the most promising substitute of this kind. A pint of air driven slowly through a solution of this salt containing 2 per cent. of cyanogen did not produce the slightest change.

Reactions of Saponin. Dr. H. Koehler. (*Amer. Journ. Pharm.*, 4th series, iii., 393; from *Neues Jahrb. für Pharm.*, 1873, June.)

1. Saponin yields with water an opalescent solution, foaming like soap solution; it is insoluble in ether, but soluble in petroleum ether, benzin, chloroform, alcohol, and amylic alcohol.

2. Concentrated sulphuric acid yields with it a carmine red, faintly brownish solution, which becomes violet blue on the margin after about fifteen minutes.

3. The addition of bichromate of potassium changes this colour to dirty green.

4. Saponin dissolves readily and completely in diluted and concentrated nitric acid, with a yellow colour.

5. The addition of bichromate to this solution produces no change.

6. On boiling saponin with concentrated phosphoric acid, a characteristic odour or coloration is not produced.

7. Bichromate, added after the phosphoric acid, produces no change.

8. Evaporated with muriatic acid, saponin yields a grey jelly; bichromate merely darkens the liquid.

9. Saponin gives with acetic acid, with difficulty, a colourless solution, in which no change is produced by bichromate.

10. Saponin is split, like other glucosides, by dilute acids.

11. Ammonia water dissolves saponin in the cold, yielding a foaming solution, from which acetic acid reprecipitates saponin.

12. Caustic soda dissolves saponin, but the solution is less clear, and foams like soap solution. Acetic acid reprecipitates it.

13. Potassa behaves precisely like ammonia and soda.

14. A similar behaviour have the carbonates of the alkalis.

15. Bicarbonates of the alkalis have an analogous behaviour.

16. Tincture of galls produces in solutions of saponin a whitish flocculent turbidity, which disappears on boiling.

17. A similar whitish turbidity is obtained with ferridcyanide and with sulphocyanide of potassium.

18. Ferrocyanide of potassium does not alter the solution of saponin.

19. Iodide of potassium,

20. Bichromate of potassium, and

21. Picric acid produce no change in solutions of saponin.

22. Hydrate of barium yields a white precipitate, which is insoluble on boiling, and cakes together.

23. Subacetate of lead causes a white voluminous precipitate, caking on boiling.

24. Saponin separates mere traces of suboxide of copper from alkaline copper solution; pure sulphate of copper is not affected.

25. Acetate of zinc } produce in solutions of saponin white

26. Ferric chloride } precipitates, which do not disappear on

27. Arsenious acid } boiling.

28. On boiling saponin with solution of nitrate of silver, the latter is slowly reduced.

29. Chloride of gold, and

30. Corrosive sublimate give no reaction with saponin.

Iodide and Bromide of Ammonium. Chas. Rice. (*Amer. Journ. Pharm.*, 4th series, iii., p. 249).

The process adopted in the last U.S. Pharmacopœia for the preparation of iodide of ammonium yields an excellent product, although the latter is contaminated with a minute proportion of sulphate of potassium. But the quantities of iodide of potassium and of sulphate of ammonium, which the U.S. Pharmacopœia directs to be used, are not correct. Four troy ounces of iodide of potassium, combining in equivalent proportion with sulphate of ammonium (supposing the latter to contain no water of crystallization) require more than one troy ounce of the latter, as the following diagram shows:—

$2 \text{ K I } (322) + (\text{N H}_4)_2 \text{ S O}_4 (132) = \text{K}_2 \text{ S O}_4 (174) + 2 \text{ N H}_4 \text{ I } (290).$
Hence 1920 grs. of iodide of potassium require for complete decomposition 764 grs. of sulphate of ammonium. Now, since it is safer to employ an excess of sulphate of ammonium than of iodide of potassium, the quantity of the former should not be less than 867 grains, which would make an allowance for an additional equivalent of water in the sulphate, and any excess of the latter would be thrown down along with sulphate of potassium by alcohol.

As regards the process for preparing bromide of ammonium, the author regrets that the committee did not adopt the same plan here as in the case of the iodide. It is true that the product will not contain any foreign salt, such as sulphate, and that the only drawback in this process is the not unfrequent elimination of bromine and hydrobromic acid; but on the whole he thinks that the advantage is on the side of the other process, which yields a product, never exhibiting any signs of decomposition, although con-

taining a very small amount of sulphate of potassium, and being all that can be desired by the photographer as well as by the pharmacist. He has prepared several hundred pounds during a number of years past by the sulphate of ammonium process, and has never found the least trace of decomposition, while the same salt prepared by the other (now official) process, has not unfrequently liberated free bromine and turned acid. It is a curious fact that iodides and bromides, especially the former, prepared by the intervention of iron, are rather prone to develop in the course of time, free hydracids and halogens, unless the salt has been exposed to a high degree of temperature, which is of course inadmissible in the case of ammonium salts. One explanation of this fact is suggested by the results observed in following another well known process, formerly much used, and even yet practised, in the preparation of iodides and bromides, namely, to convert the I and Br into HI and HBr, by means of H_2S , either in the presence of the base or its carbonate, or previous to coming in contact therewith. This process yields a product, in the case of I, of very feeble stability, and obstinately retaining traces of sulphur, which it is next to impossible to get rid of. In the case of Br, the durability is greater, but decomposition ensues after some time. The presence of sulphur, even in most minute proportions, appears to lead to such a result, and traces of it, present in the iron employed, are probably the cause of like effects in the first mentioned process. Photographers can make no use whatever of such iodides and bromides; the faint trace of sulphur still remaining produces at once a peculiar fogginess and spots upon the film, and there is scarcely a more sensitive test for the detection of minute traces of sulphur, than the silvered collodion-film.

The following is a working formula for bromide of ammonium.

Dissolve 4 troy ounces of bromide of potassium in 6 fluid ounces of boiling water, and 3 troy ounces of sulphate of ammonium in $4\frac{1}{2}$ fluid ounces of boiling water. Mix the solutions while hot, and allow to cool. Then add $1\frac{1}{2}$ ounces of alcohol, and set aside for twenty-four hours. Pour off the clear liquid, wash the precipitate with a small quantity of a mixture of 1 part alcohol and 4 parts water, and concentrate to the point of crystallization. In working upon a larger scale, it is advisable to redissolve the first crop of crystals of bromide of ammonium in a small quantity of very cold water, and allowing as short a time as possible for the solution. The greater part of the accompanying sulphate of potassium, which has crystallized out at the same time, will remain undissolved

at first, and may be removed, when the solution may be again concentrated until a pellicle forms. The successive crops of crystals are first drained, and then dried on blotting paper laid on porous bricks, with a very gentle heat.

A New Method for the Detection and Estimation of Alum in Bread. Edward L. Cleaver. (*Pharm. Journ.*, 3rd series, iv., 851.) The method proposed by the author, is based on Esilman's process for estimating alumina in mineral phosphates by means of hyposulphite of sodium. (*Chemical News*, xxviii., No. 72.) A slightly acid solution of an aluminium salt in the presence of excess of a phosphate and hyposulphite of sodium is decomposed, the radical which was combined with the aluminium uniting with the sodium of the hyposulphite, sulphurous acid being set free, whilst the aluminium is completely precipitated as phosphate of aluminium, together with free sulphur, and on ignition pure phosphate of aluminium remains.

It will be seen from this that the hyposulphite of sodium merely plays the part of a neutralizer of the acid, much in the same way as acetate of sodium acts in the preparation of phosphate of iron.

The details of the process are as follows:—

Take 1250 grains of bread, ignite in a platinum dish until fumes cease to arise, and powder the coke-like mass thus obtained. Treat this with 4 cubic centimetres of sulphuric acid and 10 cubic centimetres of water, cover with a glass to avoid loss by spurting, and set aside till action has ceased. Evaporate until fumes of sulphuric acid begin to be evolved, and when cold, add water, and boil for 15 minutes. Transfer the mass to a graduated measure, and when cold make up to 125 cubic centimetres. Filter through an unmoistened filter, until the filtrate measures 100 cubic centimetres. This liquid will contain the alumina from 1000 grains of bread. Add to the liquid 16 cubic centimetres of a 10 per cent. solution of ammonia (or sufficient to nearly neutralize the acid present without causing a precipitate) and a solution of about 20 grammes of hyposulphite of sodium. Set aside for about 15 minutes to allow of the deoxidation of any iron that may be present, and then boil for half an hour. Set aside for some hours, filter, wash the precipitate until the filtrate no longer precipitates with nitrate of barium, dry, incinerate in a *porcelain* crucible, and weigh the resulting phosphate of aluminium, 245 parts of which are equal to 907 parts of ammonia alum, or 940 of potash alum. The advantages of this process are its simplicity and the short time in which

it can be performed; the details are very few, and can be carried out by any one with a slight knowledge of practical chemistry.

A few examples are appended to show the correctness of the results.

1000 grains of bread, mixed with .105 gramme ammonia alum, gave .029 gramme of phosphate of aluminium, equal to .105 gramme alum.

1000 grains of bread mixed with .109 gramme ammonia alum, gave .030 gramme phosphate of aluminium, equal to .111 gramme alum.

1000 grains of bread mixed with .211 gramme ammonia alum, gave .058 gramme phosphate of aluminium, equal to .215 gramme ammonia alum.

This process will be found more easy and requires less time than that proposed by Mr. Crookes (*Chem. News*, iii., No. 70), which has lately been in general use.

On Cymene as a Constituent of and Derivative from Oil of Turpentine. Dr. C. R. A. Wright. (*Chem. News*, Jan. 23, 1874.)

On Feb. 6, 1873, the writer read before the London Chemical Society a paper (*Chemical News*, xxvii., 82; *Journ. Chem. Soc.*, 2nd series, xi., 549) wherein it was shown that there are reasons for supposing that the small quantities of terephthalic acid obtained by the oxidation of certain terpenes are really derived, not from the terpene itself, but from cymene simultaneously present; and it was moreover stated that cymene had been actually isolated from two such terpenes (viz., myristicene from nutmeg oil and terebinthenes from oil of turpentine) by a process suggested to the writer by Dr. Hugo Müller, viz., treating the mixture with sulphuric acid "so as to polymerise the terpene present, and then diluting with water, and distilling in a current of steam."

Shortly after (April 3, 1873), the writer read a second paper describing the properties of the cymene thus obtained, and contrasting them with those of cymene from other sources (*Chemical News*, xxvii., 180; *Journ. Chem. Soc.*, 2nd series, xi., 686).

On Feb. 21, 1873, M. Ribau communicated to the Paris Chemical Society the results of his experiments on the action of sulphuric acid on terebinthene (*Bul. Soc. Chem. Paris*, xix., 242), and on July 4, 1873, he also read another paper on the same subject (*Ibid.*, xx., 97 and 100), the result arrived at, being that cymene is formed from the terpene by the reaction $C_{10}H_{16} + H_2SO_4 = 2H_2O + SO_2 + C_{10}H_{14}$. In a postscript to the second of the above mentioned papers, written before the appearance of M. Ribau's second communication,

the writer suggested that that the cymene obtained by M. Ribau was not formed thus, but was that pre-contained as such, the main reason given being that by cautiously acting on oil of turpentine with sulphuric acid, "the writer had succeeded in isolating cymene from oil of turpentine, without the evolution of more than inconsiderable quantities of sulphurous acid." The method employed was as follows:—Oil of turpentine freed from oxidized substances by distillation over sodium was very gradually mixed with about its own weight of sulphuric acid, the mixture being carefully cooled; after a few minutes the whole was poured into a large bulk of water, the oily layer decanted and distilled with water, and the oily layer of distillate treated repeatedly in the same way. Only once or twice was a very faint odour of sulphurous acid observed; and, as about 3 per cent. of nearly pure cymene was ultimately obtained (irrespective of losses and waste in distillation), it was inferred that this was pre-contained as such.

It being in no way improbable that some specimens of oil of turpentine might contain more cymene than others, the pre-existence of M. Ribau's cymene thus appeared exceedingly probable, even though the amount obtained by this chemist was considerably above 3 per cent.

Between August 20 and September 1, 1873, Herr Orlewski read before the meeting of Russian Naturalists, at Kasan, a paper, in which he states (as reported by Richter, *Ber. Deut. Chem. Ges.*, vi., 1257) that considerable quantities of cymene are produced by the action of sulphuric acid on turpentine oil in the ordinary process for preparing terebene, and that terebene itself is altered by this reagent, cymene being formed, and sulphurous acid simultaneously generated. At the same time Herr Orlewski stated, that by long continued fractional distillation of an old yellowish sample of turpentine oil, he succeeded in isolating a small percentage of cymene (10 grammes from $1\frac{1}{2}$ litres), and ascribed the presence of this substance to the action of atmospheric oxygen on the original oil, whereby hydrogen is removed from the terpene.

In reference to this explanation, the writer had shown (*loc. cit.*) that by the action of oxidizing agents, certain terpenes undergo the reaction, $2C_{10}H_{16} + O_2 = 2C_{10}H_{16}O$, the resulting bodies presenting great similarity to certain isomerides of camphor, which readily break up by treatment with dehydrating agents into cymene and water, $C_{10}H_{16}O = H_2O + C_{10}H_{14}$. M. Ribau has recently published (*Bulletin of the Paris Chemical Society*, Jan. 5, 1874, 3, 4), two notes: the one a reclamation for priority over Herr Orlewski, the

other a discussion of the reasons assigned by the writer for supposing that the cymene obtained by M. Ribau was precontained as such.

As regards the first question, a comparison of the above dates will show that, whilst M. Ribau undoubtedly preceded Herr Orlewski in this matter by several months, the results of the writer were made public in London more than a fortnight before those of M. Ribau were first brought before the notice of Parisian chemists; it is therefore evident that, whilst the experiments of M. Ribau and the writer must have been carried on almost simultaneously, the actual claim to priority rests with England rather than with France or Russia.

As regards the second point, the writer confirms the exactitude of M. Ribau's results; whilst he has no doubt from his own results (and those of Herr Orlewski) that cymene is actually pre-contained in, at any rate, some specimens of oil of turpentine; and in other terpenes he has yet found that when the action of the sulphuric acid is prolonged for some hours at the ordinary temperature (and especially if the mixtures be made quickly, so as to heat rapidly), sulphurous acid is copiously given off, and *a much larger quantity of cymene is obtainable than can be, if all possible care and precautions are taken to avoid the formation of sulphurous acid*; this additional quantity must necessarily be found, as M. Ribau first suggested, by the reaction $C_{10}H_{16} + H_2SO_4 = 2H_2O + SO_2 + C_{10}H_{14}$.

Ferric Carbonate. R. Rother. (*Chic. Pharm.*, vi., 353.) The author has succeeded in producing a ferric oxycarbonate, which promises to supersede ferric hydrate for most pharmaceutical purposes.

Ferric oxycarbonate (an expression which the writer merely employs as a distinguishing term) when yet moist, differs characteristically from the hydrate by the copious evolution of carbon dioxide when treated with acids. Furthermore its solution in acids is immediate and perfect, definite and exact saturation being a predominant feature.

Secondly, ferric oxycarbonate differs diametrically from the hydrate in form and colour. Whilst the hydrate is brownish red, this is bright red when moist, approaching to scarlet when dry. It is not gelatinous, but compact, yet not granular, and not exceedingly heavy. It possesses a remarkable evenness of structure and aggregation, being miscible with water to the production of a uniform liquid, holding the precipitate regularly suspended during the course of its deposition when placed at rest.

Owing to its compact form, ferric oxycarbonate deposits more

firmly, rapidly, and closely than ferric hydrate, and can be washed by decantation. When washed and dissolved with the aid of gentle heat in citric acid, it forms a solution stronger than the officinal solution of ferric citrate, and therefore requires dilution instead of considerable evaporation, as usually required by the ordinary method.

The writer's process for preparing ferric oxycarbonate is as follows:—

R	Ferrous Sulphate Cryst.	. . .	24 troy ounces.
	Sulphuric Acid	. . .	4½ „
	Potassium Chlorate	. . .	848 grains.
	Sodic Carbonate Cryst.	. . .	44 troy ounces.
	Water sufficient.		

Pour the sulphuric acid into two pints of water with constant stirring, and add the ferrous sulphate; with continued stirring now add the potassium chlorate, a little at a time at first, but more rapidly in proportion as the ferrous sulphate dissolves. Then place the sodic carbonate into a capacious vessel, and add about one fourth of the solution of ferric sulphate; or better, use first a similar volume of water, apply heat immediately, and when nearly all the carbonate is dissolved, add the remainder of the solution, one-fourth at a time, with constant stirring. Dilute the mixture with six to eight times its volume of water, let the precipitate subside, and remove the supernatant liquid by means of a siphon, mix the residue again with water as before, and repeat the washing as at first, three or four times, or until the washings give no precipitate with barium chloride. If large vessels for this purpose are not convenient, the precipitate may be divided among a number of smaller vessels, and thus washed with equal rapidity, and perhaps greater facility in the manipulation. Lastly, pour the precipitate after the final decantation upon a filter, drain off the surplus water, and spread the residue out to dry in the open air.

The writer now prepares solution of ferric citrate as follows:—

Take the washed and drained precipitate of ferric carbonate obtained from 24 troy ounces of ferrous sulphate as above. Citric acid cryst., 18 troy ounces.

Water, if required, sufficient.

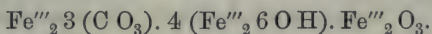
Place the citric acid into a capacious capsule, add the precipitate gradually, and heat the mixture. After solution is complete, add water if necessary, to the measure of three pints, and strain through muslin.

The moist ferric oxycarbonate can be easily dried between folds of paper, and then forms friable fragments which crumble under mild pressure to an almost impalpable powder. The writer believes

that this oxycarbonate is in many respects a great improvement over the officinal subcarbonate of iron.

It is particularly adapted for the preparation of ferric acetate solutions, as it can be so easily washed and dried, and because definite exact saturation can be speedily attained. An absolutely pure ferric acetate can thus be produced from a ferric compound, which presents the iron in its normal and active state, and consequently the resulting salt will not be so prone to separate insoluble basic acetates.

The author's analysis of this oxycarbonate shows it to be a combination of normal ferric carbonate with ferric hydrate and ferric oxide, whose composition is represented by the formula



It is probable, however, that twice the indicated amount of the carbonic radical exists in the freshly precipitated carbonate, since, during the process of washing, there is a continual rise of bubbles of carbonic acid gas.

Pyrogallic Acid as a Reagent. M. Schlagdenhauffen. (*Pharm. Journ.*, 3rd series, iv., 772; from *L'Union Pharmaceutique*, xv., 5.)

The action of pyrogallic acid upon the alkalies and the alkaline earths is well known. It forms with the caustic alkalies dark brown coloured compounds, and with lime water a splendid violet solution, which finally deposits a black product by a decomposition not yet investigated. With the carbonates and bicarbonates analogous results are obtained. A few drops of a 10 per cent. solution of pyrogallic acid, added to bicarbonate of magnesia, or bicarbonate of lime in sufficiently dilute solution to remain at first uncoloured, gives after six hours an abundant black deposit. This reaction the author has made use of in the examination of alkaline mineral waters, a yellow coloration being produced at once in the water most impregnated with carbonate, followed, after ten or twelve hours by a plentiful black precipitate, whilst a negative result, amounting to only a yellow or feeble brown colour, has been found to indicate the absence of soluble carbonates. The presence of calcareous carbonates in potable waters may be detected by adding a small quantity of pyrogallic acid in aqueous or alcoholic solution to a few cubic centimetres of the water to be examined.

The alkaloids have also the property of colouring pyrogallic brown, or at least a deep orange-yellow, but the reaction is not manifest in less than a dozen hours. This character distinguishes

the organic bases from neutral crystallizable bodies and glucosides, the latter remaining perfectly inactive in the presence of pyrogallic acid. The heat of a water-bath increases the depth of colour. Alcoholic solution of mercuric chloride, added to the coloured liquid containing the alkaloid, causes immediately a black deposit, but a pyrogallic solution containing a glucoside or neutral crystalline body is not coloured by the addition of the bichloride.

Some experiments, based upon this reaction, were made to define the relative alkalinity of the alkaloids. A gram of pyrogallic acid dissolved in 10 c.c. of alcohol, added to 2 c.c. of a saturated alcoholic solution of mercuric chloride, was used as the reagent. Two or three drops were placed in a porcelain capsule, and a few crystals of the substance to be examined added. In some cases the crystals were blackened immediately upon contact; others at first took a light tinge, and became more coloured after a few minutes; whilst some alkaloids only became coloured after a slight elevation of temperature. The following represents the result of the experiments:—

	In the cold.	With heat.
Atropine . . .	Black, immediately	Black.
Veratrine . . .	" "	"
Codeine . . .	Brown, immediately	"
Quinidine . . .	" "	"
Cinchonidine . . .	" "	"
Thebaine . . .	Pale yellow; brown after $\frac{1}{2}$ of an hour .	"
Narcotine . . .	" "	"
Papaverine . . .	" "	"
Brucine . . .	No change at first; brown after $\frac{1}{2}$ of an hour .	"
Strychnine . . .	" "	"
Delphinine . . .	" "	"
Morphine . . .	" "	"
Quinine . . .	" "	"
Cinchonine . . .	" "	"

In operating with neutral crystallizable bodies and glucosides, and heating the mixture, the black coloration was never obtained, and even the residue never presented a colour darker than that produced by a mixture of the body with the bichloride or pyrogallol used separately.

Picrotoxin, phlorizin, salicin, santonin, æsculin, coumarin, amygdalin, meconin, and digitalin, in no instance resembled the alkaloids in their behaviour. It would therefore appear that the pyrogallo-mercuric, like the guaiaco-mercuric test, can be used to distinguish the glucosides and neutral crystallizable bodies from organic bases, and thus facilitate analytical research.

In replacing the mercuric chloride by ferric chloride analogous results are obtained. The solution of pyrogallate of iron used by the author in his experiments contained only a minimum quantity of metallic salt, the addition of a trace of ammonia or caustic alkali to which gives rise to a deep blue-violet colour. This very delicate reaction of the salts of peroxide of iron, recently indicated by M. Jacquemin, can also be used to recognize the presence of alkalies. The solution which gave the author the best results was composed of—

Pyrogallic Acid	0.50 gram.
Water	5 c.c.
Alcohol	5 c.c.
Perchloride of Iron	0.0001 gram.

The pyrogallate of iron so prepared, colours blue crystals of strychnine, brucine, morphine, codeine, and all other alkaloids. Crystals of narcotine are coloured difficultly, and those of narceine acquire only a scarcely appreciable violet tint, but upon heating them in a water-bath they both yield a very deep bluish violet residue. The glucosides and neutral bodies give no coloration in the cold, and in the heat no deeper tinge than pyrogallate of iron heated separately. A solution of cupric chloride added to pyrogallic acid gives analogous results, the coloration in that case being a nearly black brown.

The author considers that all these reactions are explained by the oxidation of the pyrogallic acid under the influence of various metallic oxides. The addition of an alkali, alkaline salt, or free alkaloid, to one or other of the foregoing solutions, produces, in the presence of a metallic chloride, a double decomposition; there is formed an alkaline chloride or a hydrochlorate of an alkaloid and a more or less decided coloration, resulting from the oxidation of the pyrogallic acid by the metallic oxide at the moment when the double decomposition takes place.

Santoninic Acid. O. Hesse. (*Journ. Chem. Soc.*, March, 1874; from *Ber. der deut. chem. Ges.*, 1874, 1280.) Santonin is the anhydride of an acid, of which hitherto only the salts have been known. The free santoninic acid is obtained by adding an excess of dilute hydrochloric acid to a cold aqueous solution of the sodium salt, and shaking at once the milky liquid with ether. From the ethereal solution granular crystals soon separate out, which are recrystallized from alcohol.

Santoninic acid, $C_{15}H_{20}O_4$, forms white, rhombic crystals, which are not coloured yellow by exposure to light. It is sparingly soluble

in cold water, more freely in boiling water, and readily in alcohol, but not very freely in ether. Its aqueous solution has a strongly acid reaction, and, when not, decomposes the carbonates of sodium and calcium. The santonates have an alkaline reaction, and are not coloured red by alcoholic potash. When the acid is heated to 120°, it is resolved into santonin and water; the same decomposition is produced by adding sulphuric acid to its aqueous solution; hydrochloric acid acts in the cold in a similar way, but more slowly; while by adding either of these acids to a hot solution of a salt, santonin is at once precipitated.

Cannizzaro and Sestini have lately shown that when santonin is heated for some time with an alkali, it is converted to the stable santoninic acid, which is isomeric with santoninic acid, but cannot be reconverted into santonin.

Experiments on some Varieties of Camphor. By Professor Flückiger. (*Pharm. Journ.*, 3rd series, iv., 828.) The interesting investigations on the N-gai camphor, due to Mr. Plowman, induced the author to make various experiments with the following different kinds of camphor, of which only No. 3 consisted of pure crystals.

1. *Common Camphor of Cinnamomum camphora* (F. Nees et Eberm.).
2. *N-gai Camphor* in the crude state, consisting of whitish crystallized granules.

3. *N-gai Camphor* in the pure state, forming flattish colourless pieces, highly crystalline, yet not exhibiting well developed crystals.

4. *Borneo Camphor*, also called *Malay Camphor*, or *Camphor of Dryobalanops aromatica* (Gärtn.), in the crude state, obtained from Sumatra.

5. *Camphor of Dryobalanops aromatica* (Gärtn.), as met with in the London market by Mr. J. E. Howard in 1850, under the name of "native camphor."

6. *Crude Camphor* from Hong Kong, presumed, on account of its peculiar odour, to be different from common camphor. It occurred in the London market in 1864.

Des Cloizeaux has proved conclusively that common camphor crystallizes in forms belonging to the hexagonal system. They exhibit in polarized light brilliant colours like other crystals not belonging to the cubic system. This is easily demonstrated by examining a clear splinter of camphor under the polarizing microscope, or by melting a little camphor between two slips of glass, and examining it in the same way. Hexagonal crystals are evident in every bottle in which ordinary camphor is kept for some time, and camphor dissolved in alcohol of about sp. gr. 0.89, separates on cool-

ing in crystalline tufts exactly resembling the crystals which are slowly formed in winter time on the surface of water. The crystals of camphor are unable to deviate the ray of polarized light, but their alcoholic or other solutions turn the plane of polarization to the right hand.

The crystals of the camphor of Borneo, derived from *Dryobalanops*, according to Des Cloizeaux, belong to the cubic system, and examined in the way just stated, the crystals of samples 4 and 5 do not display any action on polarized light. It is well known that cubic crystals, that is to say regular cubes and all allied forms, are devoid of that optical power. The alcoholic solution of Borneo camphor, on the other hand, possesses, as shown long ago by Biot, a dextrogyre power a little inferior to that observed in common camphor under the same circumstances.

The crystals of *N-gai camphor*, two or three, examined by means of the polarizing microscope, proved likewise to belong to the *cubic* system. The *crude camphor*, No. 6, seemed to consist of a cubic camphor, accompanied by a certain amount of another camphor doubly refracting in polarized light, like common camphor. The presence of the latter would scarcely be revealed by any other means than the microscope, for the odour and optical behaviour of this sample is on the whole like that of *dryobalanops* camphor.

On the surface of water both *N-gai camphor* and Borneo camphor turn as rapidly as common camphor; both also are able to swim on water owing to adhering air, for they sink if deprived of that air.

Common camphor and chloral hydrate, about the same weight of each, both in perfectly dry and large pieces or crystals, kept for some hours in a carefully dried and closed vessel are liquefied. This is also the case with *N-gai camphor* and with Borneo camphor.

Although *N-gai camphor* differs but slightly from Borneo camphor, both being of the same composition, and exhibiting the same general behaviour, there is a well-marked difference, inasmuch as the *N-gai camphor in alcoholic solution deviates the ray of polarized light to the left hand*.

For the optical researches, Wild's polaristrobometer was used, and the deviations were observed in monochromatic light, afforded by a flame coloured by means of a salt of sodium (borate). The results are summarized in the table below, which shows the numbers as observed directly. The starting point of the observations being 47.7° , this number is to be deducted from those given in the table in order to get the dextrogyre deviations, the latter answering to numbers succeeding 47.7° . The numbers inferior to 47.7° point out

a levogyre power, the amount of which is found by deducting the number directly observed from 47.7° . The table thus shows for instance that the solution 6 of common camphor in a column of 50 millimetres long, deviated $57.5^{\circ}-47.7^{\circ}$; that is to say, 9.8° to the right hand, whereas the *levogyre* power of a similar column of solution 2 of N-gai camphor is $47.7^{\circ}-40.3^{\circ}=7.4^{\circ}$.

The true deviation of N-gai camphor is represented by the figures under 2; the sample 1 contained a certain amount of impurities, its solution showed therefore a weaker action. Under 3 and 4 the table presents not quite the full deviation of Borneo camphor, the samples being too small to allow of purification. The numbers are nevertheless sufficient to manifest the great difference between the N-gai camphor and that of *Dryobalanops*; they confirm also that the rotatory power of ordinary camphor is stronger than that of Malay camphor.

Table showing the Deviations of the following Solutions of Camphors as observed in Wild's Polaristrobometer.

Starting Point: 47.7° .

Length of the column of the solution	Milli- metres. 25	Milli- metres. 50	Milli- metres. 100
	—	—	—
1. Crude N-gai camphor dissolved in its equal weight of absolute alcohol	43.6°	38.5°	
2. Pure N-gai camphor, dissolved in its equal weight of absolute alcohol			
3. Dryobalanops camphor, De Vriese's, dissolved in its equal weight of absolute alcohol	43.8	40.3	
4. Dryobalanops camphor, Howard's, dissolved in its equal weight of liquid			
5. Crude camphor from Hong Kong, dissolved in its equal weight of absolute alcohol	52.0	56.6	
6. Common camphor, dissolved in its equal weight of absolute alcohol			
7. Common camphor, 1 part in 9 parts of absolute alcohol	52.1	56.6	
8. Common camphor 1 part, alcohol 0.8185 sp. gr. 6 parts, and 3 parts of water			
9. Common camphor, in its equal weight of chloroform	52.4	57.5	68.5
10. Common camphor, in its equal weight of bisulphide of carbon			
11. Common camphor, 1 part, alcohol 0.8185 sp. gr. 6 parts, and 3 parts of water	48.3	49.9	51.0
12. Common camphor, in its equal weight of acetone			
13. Common camphor, in its equal weight of methylic alcohol	54.5	62.4	
14. Common camphor, in its equal weight of bisulphide of carbon			
15. Common camphor, in its equal weight of acetone	54.4	62.0	
16. Common camphor, in its equal weight of methylic alcohol			
17. Common camphor, in its equal weight of acetone	52.7	58.7°	
18. Common camphor, in its equal weight of methylic alcohol			
19. Common camphor, in its equal weight of acetone	53.0	58.3	
20. Common camphor, in its equal weight of methylic alcohol			
21. Common camphor, in its equal weight of acetone	52.2	57.5	
22. Common camphor, in its equal weight of methylic alcohol			

Being engaged in these experiments, the author was curious to know whether the polaristrobometer would afford the means of estimating the percentage of camphor in solution. The experiments under 7 and 8 prove that the rotatory power of somewhat dilute solutions of camphor decreases too rapidly to allow such a quantitative method. Moreover, there is another fact still less in favour of such an estimation. The table gives in many instances two different numbers for one and the same observation; it is in fact not always possible to meet with an undoubtedly exact number of deviation. This uncertainty is sometimes very troublesome, whereas in other cases the observation can be performed with all desirable exactness.

Another question, well worthy of examination, concerns the influence of different solvents on the optical properties of camphor. The few facts ascertained under 9 and 10, show that influences of that kind exist; the rotatory power of ordinary camphor is increased by dissolving it in chloroform or bisulphide of carbon. It would be a matter of interest to examine, in that respect also, the other varieties of camphor mentioned in these notes.

From the above observations it follows, that the new camphor from the N-gai plant, *Blumea balsamifera*, DC., of the order *Compositae*, crystallizes in the cubic (regular) system, like that of Borneo from *Dryobalanops*. Both, according to Mr. Plowman, agree with the formula $C_{10}H_{18}O$, but the author's experiments prove that the N-gai camphor in alcoholic solution is as much levogyre as the solutions of Borneo camphor are dextrogyre. The camphor of *Blumea* has therefore very correctly been termed by Professor Attfield the *twin-brother* of the famous product of *Dryobalanops*, the Borneo or Malay camphor.

There are two other camphoraceous substances forming optically indifferent crystals of the cubic system, namely, *Terecamphene*, $C_{10}H_{16}$, and the monochlorhydrate $C_{10}H_{16} + HCl$ of the oil of turpentine of *Pinus Pinaster*, Solander, and other pines. Both these substances have been prepared and examined in 1862 by Berthelot. The alcoholic solution of the latter appears to possess nearly the same levogyre power as that of our *Blumea* or N-gai camphor. The rotation of the solution of terecamphene is twice as considerable.

These two substances are in composition widely different from the camphor of *Blumea*, but there is another camphor agreeing with the latter in that as well as in other respects. In 1856, Jeanjean examined the products of the fermentation of the sugar contained in madder, the root of *Rubia tinctorum*, L. One of these is a

camphor having the composition of Borneo camphor, but possessing exactly the same rotatory power as our N-gai camphor. It seems after all very likely that camphor of *Blumea* and camphor of *Rubia*, as produced in the fermentation of sugar of madder, are but one and the same substance. Jeanjean attributed to it a peppery odour.

This chemist has not examined the nature of the crystals of the rubia camphor; by boiling them for a short time with nitric acid he obtained the compound $C_{10}H_{16}O$, agreeing in composition with ordinary camphor, but differing from it by deviating the ray of polarized light as much to the left as common camphor does to the right hand. This refers, of course, to the alcoholic solutions of these camphors.

The author devoted to a similar treatment the small quantity of N-gai camphor, still at his command after the foregoing experiments. He obtained crystals which were entirely devoid of the peculiar odour of N-gai camphor, and rather reminded one of ordinary camphor. The quantity of camphor of sample 2 being too small for further exact investigations, he could only ascertain that its alcoholic solution was levogyre, without estimating the amount of deviation. But what is more interesting is the fact, that the polarizing microscope proved the crystals of the camphor under notice not to belong to the same system as their mother-substance; they displayed, indeed, brilliant colours, as showing that there was no longer any question of the cubic system.

It is very remarkable that, according to Chautard, the oil of feverfew, *Chrysanthemum Parthenium*; Pers., on cooling, or by treating it with nitric acid, yields a levogyre camphor, $C_{10}H_{16}O$, which in all probability is identical with that prepared by Jeanjean as just stated from *Rubia* camphor.

It is scarcely necessary to remark that the camphor, $C_{10}H_{16}O$, which may be obtained by oxidizing the Malay camphor, is absolutely identical with ordinary camphor. By treating the small remaining quantity of sample 5 with nitric acid, the author quickly succeeded in getting it. The crystals, after washing and drying, were examined under the polarizing microscope, where they proved most brilliantly not to belong to the cubic system but to the hexagonal. The microscope thus enables us to demonstrate very manifestly the transformation of the optically indifferent crystals of dryobalanops camphor into laurel camphor, even in the smallest fragment.

Mr. Hanbury has pointed out how much N-gai camphor is

esteemed in China; it is curious, from a historical point of view, that the Chinese possess in their own country a variety of camphor so very closely allied to the Malay camphor. Why have they imported, from time immemorial, the latter from the Archipelago? Why do they still appreciate Malay camphor so enormously higher than even N-gai camphor? And not the least curious is the fact that they appear to be well aware of physical differences, which the chemists of Europe have been endeavouring to fix more precisely by the implements of modern science.

It has been proved that *Blumea balsamifera*, DC., the N-gai plant of the Chinese, yields a camphor $C_{10}H_{18}O$, which forms crystals of the cubic system; these are optically inactive, but afford alcoholic solutions which deviate the ray of polarized light to the left hand. These crystals can be transformed into a camphor, agreeing no doubt with the formula $C_{10}H_{16}O$, whose crystals no longer belong to the cubic system. Their alcoholic solution is levogyre. This latter camphor appears to occur in feverfew.

Malay camphor from *Dryobalanops*, also, in cubic crystals devoid of optical power, and having the formula $C_{10}H_{18}O$, affords alcoholic solutions which possess the same rotation as those of N-gai camphor, but to the right hand. The camphor, $C_{10}H_{16}O$, obtainable from Malay camphor, belongs to the hexagonal system, its solutions are dextrogyre; it has been met with as yet only in *Cinnamomum Camphora*.

Analysis of Iodine. By G. Tissandier. (*Amer. Chem.*, May, 1874; from the *Moniteur des Produits Chimiques*.) The method of analysis producing the best results is to dissolve the iodide in sulphurous acid, and precipitate it as iodide of silver, in the presence of an excess of ammonia, to dissolve any chloride which may be present. The principle of the process is simple, yet certain precautions are necessary in order to insure the success of the analysis.

1. *Weighing the Iodine.* As iodine volatilizes with great readiness, it is impossible to weigh it upon an open watch-glass as in ordinary analyses. Place a few grammes of iodine in a well-corked specimen tube, and weigh. Throw a few decigrammes into the sulphurous acid solution, and rapidly close the tube. The difference in the weight of the tube gives the amount of iodine taken for analysis.

2. *Determination of the Iodine.* Place in a beaker or flask of about one litre capacity 40 c.c. of concentrated and freshly prepared solution of sulphurous acid. In this the iodine is dissolved by stirring. If an appreciable residue remains, this is filtered off and weighed, care being taken to keep the funnel covered during the operation.

This however is seldom necessary, commercial iodine containing generally but small traces of insoluble substances.

Pour now into the beaker at least half a litre of boiling water, and an excess of ammonia, and then add nitrate of silver, cover the beaker, and allow the precipitate to stand about half an hour in a warm place. At the end of that time filter through Swedish paper without folds, wash with boiling water, taking care to gather the precipitate at the apex of the funnel. When thoroughly washed, so as to give no turbidity with hydrochloric acid, the precipitate is dried in an air bath at 110°C .

Care must be taken, prior to igniting the argentic iodide, to remove all trace of carbon, lest the precipitate should be reduced to metallic silver. Remove the iodide as completely as possible from the filter by means of a platinum spatula, to a piece of glazed paper; cut off the apex of the filter, and calcine it in a small weighed porcelain crucible. When the ash is perfectly white, add the iodide, and heat till it begins to fuse; then cool and weigh. The precipitate contains 54 per cent of iodine.

3. *Determination of Chlorine.* To the filtrate from the last determination add an excess of nitric acid, filter, and weigh the resulting chloride with the usual precautions.

4. *Determination of the Ash.* Weigh about five grammes, and ignite gently in a porcelain capsule till all the iodine has volatilized; the residue should be very slight, and consists chiefly of silica and alumina, with trace of alkaline chlorides.

5. *Determination of the Moisture.* The quantity of moisture in commercial iodine is often considerable, frequently as much as 20 per cent. This must be determined by difference, as all direct determinations, being attended by heat would cause large quantities of iodine to volatilize.

Subjoined are a number of analyses of commercial iodine, Nos. 3, 4, and 5 being good samples; Nos. 1 and 2 containing more water than is usually found.

	1.	2.	3.	4.	5.
Iodine .	76.21	79.50	84.25	88.61	94.12
Chlorine .	0.88	0.71	0.92	0.52	0.30
Ash .	1.11	1.02	0.80	0.72	0.40
Moisture .	21.80	18.77	14.03	10.15	5.18
	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00	<hr/> 100.00

The Estimation of Mercury. By G. Kustel. (*Journ. de Pharm.*

d'Anvers, xxxix., 555; from *L'Art Médical*.) The author proposes two new methods; the first, which is volumetric, is based on the fact, that the precipitate formed by ammonia in bichloride of mercury is soluble in cyanide of potassium. Add a few drops of ammonia to a solution of bichloride of mercury, then a titrated solution of cyanide of potassium, until the precipitate formed by the ammonia has redissolved. If other metals besides mercury are present, the latter must first be separated out.

The second method is based on the electrolysis of sulphate of mercury in a platinum capsule; the metallic mercury which has been deposited is weighed.

The Separation and Detection of Strychnia in Poisoning Cases. J. St. Clair Gray and J. B. Lyman. (*Zeitschr. f. analyt. Chem.*, 1873, 125; from *Neues Jahrb. für Pharm.*) The substance under examination is mixed in a mortar with sufficient water to form a very thin paste; to this an excess of acetic acid is added, the mixture digested at about 27° C. for 24 hours, and then placed in a dialyser floating upon 10 times the quantity of water. After 48 hours the dialysate is evaporated to the bulk of one fluid drachm, acidulated by acetic acid, and shaken with successive portions of chloroform, until the latter ceases to leave a residue upon evaporation. The aqueous solution is then mixed with ammonia in excess, and shaken with four volumes of chloroform for five minutes; after which the chloroform is separated and evaporated on watch-glasses in such a manner that each drop is allowed to evaporate before the next drop is added. The residue is moistened with one drop of pure H_2SO_4 , and, if it remains colourless, used at once for Otto's test. Should the residue turn brown with the H_2SO_4 , it must be heated with a few drops of the acid to effect complete carbonization, then mixed with ammonia in excess, and again shaken with chloroform. For producing the characteristic coloration, Gray recommends the sulphuric acid solution of the strychnia to be placed upon a piece of platinum foil connected with the negative pole of a small galvanic battery, and the wire from the positive pole to be brought into contact with the solution.

Lyman states that all ozonides are capable of bringing about the characteristic play of colours, if the materials are pure; but that in the presence of impurities, oxide of silver or permanganate of potash is preferable to the chromates.

For physiological experiments with frogs, Gray recommends that the latter be wiped dry with a towel, and kept on a layer of blotting paper under a bell jar for 24 hours. With frogs

weakened in this manner $\frac{1}{30000}$ of a grain of strychnia suffices to bring on its peculiar tetanic spasms within 15 minutes.

Test for Empyreumatic Products in Glacial Acetic Acid. E. Merck. (*Neues Jahrb. der Pharm.*, xxxix., 1.) The author points out that the application of permanganate of potash as a test for empyreumatic products in glacial acetic acid, as recommended in the German pharmacopœia, may lead to erroneous results, unless the acid is diluted with water previous to the addition of the test. He examined a number of samples of glacial acetic acid of different manufactures, and found that the strong acid always decolourizes the permanganate in a very short time, but that the diluted acid, if pure, does not do so.

Detection of Nitrites and Nitrates in Water. H. Kämmerer. (*Zeitschr. f. analyt. Chem.*, 1873, 377.) The presence of nitrites in water is generally detected by means of iodide of potassium, starch, and sulphuric acid. In the presence of nitrates and organic matter, however, the liberated nitric acid may become reduced to nitrous acid, and thus give indications of nitrites where such did not exist in the water under examination. It is safer, therefore, to use acetic acid instead of sulphuric acid in testing for nitrites. If the addition of a mixture of thin starch paste with iodide of potassium and acetic acid to about half a litre of water does not produce a blue coloration, nitrites are absent, and the mixture may be forthwith tested for nitrates by $\text{H}_2\text{S O}_4$ and metallic zinc. Zinc dust is preferable to granulated zinc, as by its application the blue coloration is produced immediately.

Detection of Nitrites in Water. Dr. R. Fresenius. (*Zeitschr. f. analyt. Chem.*, 1873, 427.) The author points out that the use of acetic acid instead of sulphuric acid, for liberating nitrous acid from nitrites, greatly diminishes the delicacy of the test for nitrous acid, by means of K I and starch. He suggests a new and perfectly safe method for detecting minute traces of nitrites, which is based on the fact that very dilute solutions of nitrous acid (containing not more than six milligrammes per litre) can be distilled without suffering the least decomposition. About 300 c.c. of the water are acidulated with acetic acid, and distilled until about 10–20 c.c. have passed over. The distillate, which will contain the greater part of the nitrous acid in a much smaller bulk, is then tested with a mixture of starch paste, K I , and dilute $\text{H}_2\text{S O}_4$. The blue coloration will be instantly produced, even if the same test failed to produce it with the water before distillation.

This mode of testing combines the advantage of using acetic

acid for liberating nitrous acid from the nitrites, with that of liberating nitrous acid from the nitrites, with that of liberating HI from the KI by H_2SO_4 .

Oil of Chamomile. E. Demarçay. (*Pharm. Journ.*, 3rd series, iv., 185; from *Comptes Rendus*, lxxvii., 360.)

Having had occasion to prepare angelic acid by means of the essential oil of chamomile, the author collected a quantity of the liquid which Gerhardt considered to be a carbide of hydrogen, and to which he gave the name of camomillene. Having noticed that it presented characteristics differing from those attributed to it by Gerhardt, M. Demarçay made a closer investigation of the substance, the results of which he has recently communicated to the French Academy.

According to Gerhardt, the oil would be a mixture of a small quantity of resinous matter, of hydride of angelyl, and a carbide of hydrogen, boiling at 175°C ., isomeric with oil of turpentine. He supposed that the hydride of angelyl would possess a boiling point approaching closely to 175°C ., and that that circumstance, added to the presence of the resinous matter, would explain, on the one hand, the impossibility of separating the different principles of the oil, and on the other the gradual elevation of its boiling point. He based his conclusions on the disengagement of hydrogen when the oil was heated with potash, and the production of angelic acid.

This conclusion M. Demarçay holds to be incorrect, the disengagement of hydrogen being a pure illusion. In fact, the oil can be decomposed without the least trace of gas being observed, while the same products of decomposition are obtained.

The oil yielded the following relative results at the boiling points of its different portions:—

At 150°C . ebullition commenced, but up to about 173°C . only a few drops passed over.

From 173° to 185°C . there passed over 32 per cent. of the oil.

From 185° to 200°C . there passed over 40 per cent. of the oil.

From 200° to 250°C . there passed over 17 per cent. of the oil.

The distillation was then stopped, the brown oily residue, which formed about one-tenth of the oil, appearing to decompose.

In redistilling the fractional portions, a slight lowering of the boiling points was observed, and also points of stoppage between 177° and 184°C ., about 194°C . and 200°C .; above 230°C . a very few drops passed, the retort then containing a small proportion of a thick liquid. Operating upon small quantities of the oil, the author

was able to collect the peculiar products at the above temperatures, but found it difficult to isolate them in a state of purity.

The action of alcoholic potash and fused potash upon the oil produced identical results, provided the latter was shaken with the oil several times, or until it had no further action. This latter process, however, occasioned considerable loss of the volatile products, leading the author to prefer the former. To the oil dissolved in its volume of alcohol, its weight of potash was added in small fragments, and the whole was shaken together in a well-stoppered bottle until the potash was dissolved. After thirty-six hours the liquid had formed a mass, to which was added its volume of water. It was then distilled, first in a water bath and next over a flame, until nothing but water passed over, and the products of the two distillations were mixed. The residue was covered with a thin layer of liquid that solidified upon cooling.

The distilled portion, after the addition of carbonate of potash, separated into two layers, the upper of which, containing all the products of distillation, was dried over solid carbonate of potash, then over anhydrous baryta, and finally submitted to distillation. Ebullition commenced at 80°C . By fractional distillation a liquid was first obtained, passing over at below 100°C .; this was alcohol; the remainder passed over between 105° and 160°C ., and by repeated rectification was separated into two products, one boiling between 107° and 109°C ., and the other between 129° and 132°C .

The first of these products gave an iodide boiling between 119° and 121°C . Examined comparatively with butylic iodide it presented exactly the same reactions. Analysis of the product showed that it possessed exactly the composition of butylic alcohol.

The second body formed an iodide boiling between 144° and 146°C . It proved by its reactions and by analysis to be amylic alcohol.

The oil when treated with fused potash gave exactly similar products, and the author was in this way able to ascertain the complete absence of ethylic and propylic alcohols.

A small quantity of distillate which passed over at above 135°C . had the odour of the residues of distillation of amylic alcohol, and presented the appearance of a mixture of alcohols, and a mixture of the iodides and acetates of those alcohols was obtained from it. These products had the odour of corresponding amylic compounds, but boiled at a higher temperature, the iodides rising to 170°C ., which seemed to indicate the presence of a higher alcohol. In explanation of the difference of his results from those of Ger-

hardt, the author suggests that the presence of the alcohols escaped the notice of that chemist through the drying of his product over chloride of calcium, which combines with alcohols.

The mixture of potash salts remaining in solution after the distillation of the alcohols gave with sulphuric acid an oily layer equal in weight to nearly half the essential oil operated upon. This layer was composed of angelic and valerianic acids, very difficult to separate either by cooling or by distillation. The method that succeeded best was to etherify the mixture, and then to separate the two ethers. The valerianic acid, which was present in smaller proportion than the angelic acid, appeared to differ somewhat from the ordinary acid.

From the foregoing facts the author concludes that oil of chamomile is a mixture of several ethers, among which the angelates and valerianates of butyl and amyl predominate. To verify this hypothesis he prepared the angelates of butyl and amyl, and also analyzed portions of the essential oil. The angelate of butyl boils at 177° to 179° C.; its odour recalls that of the oil, but is not identical. The angelate of amyl boils at 198° to 200° C.; its odour much resembles that of the preceding compound. The analysis also confirmed the supposition, camomillene giving the figures of valerianate of butyl. Like the ethers also the oil combines with metallic chlorides.

Thus composition, boiling point, and manner of decomposition all agree in indicating that oil of chamomile should be looked upon as a mixture of ethers, and not as an aldehyd.

Review of the Alkaloids of the Papaveraceæ. H. Ludwig. (*Vierteljahresschr. für pract. Pharm.*, xxii., 64; from *Archiv. der Pharm.*)

A. *Opium Alkaloids (Papaver somniferum).*

I. *Morphine*, $C_{17}H_{19}NO_3$, discovered by Sartürner, in 1804. It is crystalline, has an alkaline reaction, and turns the plane of polarized light to the left. Two artificial bases have been obtained from it, viz., (1) *Apomorphine*, $C_{17}H_{17}NO_2$, prepared by Mathiessen and Wright in 1871, by means of HCl. It is white, turning green on exposure to air, and has emetic properties. (2) *Desoxymorphine*, $C_{17}H_{19}NO_2$, prepared by Wright in 1871.

II. *Narcotine*, $C_{22}H_{23}NO_7$, discovered by Derosne in 1873. It is contained in opium in the free state, but not as a salt, and may therefore be dissolved from it by benzol, but not by water. It is crystalline, and has no alkaline reaction. Four artificial bases have been obtained from it, viz. :—

- (1) *Dimethylnornarcotine*, $C_{21}H_{19}NO_7$ } prepared by the action
 (2) *Monomethylnornarcotine*, $C_{20}H_{19}NO_7$ } of HCl (Mathiessen
 and Foster, 1867).

(3) *Nornarcotine*, $C_{19}H_{17}NO_7$, prepared by the action of HI by the same authors.

(4) *Cotarnine*, $C_{12}H_{13}NO_3 + H_2O$, forming colourless, weakly alkaline crystals, soluble in water. It was first obtained by Wöhler, in 1844, by the action of MnO_2 and H_2SO_4 on narcotine. A second product of this action is opianic acid, $C_{10}H_{10}O_5$, which, by means of nascent hydrogen, can be converted into meconine, $C_{10}H_{10}O_4$, the presence of which in opium was shown by Dublanc in 1826.

III. *Hydrocotarnine*, $C_{12}H_{15}NO_3$, discovered in opium by O. Hesse in 1871. Monoclinic crystals melting at 50° , and volatile at $100^\circ C$. (*Archiv. der Pharm.*, May, 1872.)

IV. *Codeine*, $C_{18}H_{21}NO_3 + H_2O$, discovered by Robiquet in 1832, and investigated by Anderson, forms colourless rhombic crystals of a strongly alkaline reaction, soluble in 80 parts of cold and two parts of boiling water, and turning the plane of polarized light to the left. The artificial bases prepared from it are

(1) *Apocodeine*, $C_{18}H_{19}NO_3$, prepared by Mathiessen and Burnside in 1871, by means of $ZnCl_2$. It is amorphous, and acts as an emetic.

(2) *Desoxycodeine*, $C_{18}H_{21}NO_2$, prepared by Wright in 1871.

V. *Narceine*, $C_{23}H_{29}NO_9$, first isolated by Pelletier in 1832, and analyzed by Anderson, and afterwards by O. Hesse. Colourless crystals, soluble in alkaline solutions and in boiling water; neutral to test papers.

VI. *Thebaine*, $C_{19}H_{21}NO_3 + H_2O$ (Pelletier's Paramorphine) detected by Thibouméry in 1835, and analyzed by Anderson. Colourless laminar crystals, resembling benzoic acid, strongly alkaline, not sublimable, and fusing at $193^\circ C$. The artificial bases prepared from it are

(1) *Thebenine*, $C_{19}H_{21}NO_3$, and

(2) *Theboicine*, $C_{19}H_{21}NO_3$, both obtained by O. Hesse in 1870, by the action of HCl on thebaine. (*Annal. der Chem. und Pharm.*, 1870, 69.)

VII. *Pseudomorphine*, $C_{17}H_{19}NO_4$, discovered by Pelletier and Thibouméry in 1835, and more closely investigated by O. Hesse in 1867. It forms delicate silky crystals, containing from one to four molecules of H_2O . It is tasteless, neutral, and not poisonous.

VIII. *Porphyroxine*, described by Merck in 1837 as the red colour-

ing constituent of opium, is, according to O. Hesse, a mixture of several bases, including *meconidine*. The composition of the latter is represented by the formula $C_{21}H_{23}NO_4$. It is an amorphous substance, fusing at $55^{\circ}C$., and turning purplish red with dilute H_2SO_4 . (*Annal. der Chem. und Pharm.*, 1870, 47.)

IX. *Papaverine*, $C_{21}H_{21}NO_4$, discovered in 1848 by Merck. Colourless tasteless delicate prisms, neutral to test paper, and soluble in acetic acid (without neutralizing the latter). From this solution KHO and NH_4HO throw down a resinous precipitate, which soon becomes crystalline.

X. *Cryptopine*, $C_{21}H_{23}NO_5$, discovered in 1867 by J. Smiles, and T. and H. Smith, and analyzed by Hesse. It is crystallizable, strongly alkaline, and neutralizes the strongest acids. Its salts have a bitter acid taste, and separate from their solutions in a gelatinous form.

XI. *Codamine*, $C_{20}H_{25}NO_4$, discovered by O. Hesse in 1870, forms colourless crystals, fusing at $126^{\circ}C$. Its hydrochlorate is amorphous and neutral, and forms dark green solutions with strong HNO_3 , and with Fe_2Cl_6 . (*Archiv. der Pharm.*, May, 1872.)

XII. *Laudanine*, $C_{20}H_{25}NO_4$, discovered by Hesse in 1870, and found to have the same composition as codamine: forms colourless six-sided prisms, soluble in alcohol, and capable of neutralizing acids. It turns emerald-green with Fe_2Cl_6 , and orange-red with strong HNO_3 , fuses at $166^{\circ}C$., and forms crystalline compounds with KHO and $NaHO$.

XIII. *Lanthopine*, $C_{23}H_{25}NO_4$, discovered by Hesse in 1870, forms white, tasteless, microscopically small prisms, which do not neutralize acetic acid (whereas meconidine, codamine, laudanine, and codeine form neutral solutions with this acid). It is readily soluble in chloroform, but only sparingly soluble in alcohol, ether, and benzol.

XIV. *Protopine*, $C_{20}H_{19}NO_5$, discovered by Hesse in 1871, forms colourless, very delicate prisms, fusing at $202^{\circ}C$. Its alcoholic solution is strongly alkaline. Its salts are bitter, and do not gelatinize. (*Archiv. der Pharm.*, May, 1872.)

XV. *Laudanosine*, $C_{21}H_{27}NO_4$, discovered by Hesse in 1871, forms white crystalline flakes, which fuse at $89^{\circ}C$., and cannot be sublimed. It is strongly alkaline, neutralizes the strongest acids, and is not coloured by Fe_2Cl_6 . Its salts have a very bitter taste. (*Archiv. der Pharm.*, May, 1872.)

Hesse's *Deuteropine* requires further examination; Heuterberger's *Opianine* could not be obtained by Anderson; and as to Wittstein's

Metamorphine, further evidence of its individual existence is required.*

B. Alkaloids of *Papaver Rhæas*.

XVI. *Rhæadine*, $C_{21}H_{21}NO_6$, discovered in 1865 by O. Hesse, in the capsules of the red poppy, occurs also in opium, and is probably one of the constituents of Merck's porphyrosine. It forms white and almost tasteless prisms, which are rapidly decomposed by the action of acids, whereby deep purplish red solutions are produced.

Rhæagenine, $C_{21}H_{21}NO_6$, a crystallizable alkaline substance, is a decomposition-product of rhæadine.

C. Alkaloids of *Chelidonium*, *Glaucium*, and *Sanguinaria*.

XVII. *Sanguinarine* (*Chelerythrine*), discovered by Dana in 1830, in *Sanguinaria Canadensis*, and by Polex and Probst in 1838 and 1839, in *Chelidonium majus*; forms white small crystals, having a burning acrid taste. Formula, according to Schiel, $C_{19}H_{17}NO_4$; according to Flückiger, $C_{17}H_{15}NO_4$.

XVIII. *Chelidonine*, discovered by Polex in 1838, by Probst and Reuling in 1839, in *Chelidonium majus*. Formula, according to H. Will, $C_{19}H_{17}N_3O_3 + H_2O$. The alkaloid and its salts form colourless crystals, having a very bitter and acrid taste.

Application of the Yellow Sodium Light for observing the Changes in the Colour of Tincture of Litmus in Acidimetric and Alkalimetric Analyses. L. d'Henry. (*Pharm. Centralhalle*, 1873, 229.)

The light emitted by the flame of gas, oils, or candles causes the colour of tincture of litmus to appear more or less red, and therefore does not permit a very exact recognition of its change from blue to red, or from red to blue, in acidimetric and alkalimetric tests. But as these tests cannot always be performed in daylight, the author suggests the application of the yellow sodium light, in which the reddened tincture of litmus appears quite colourless, whereas the blue tincture appears as black an opaque as ink, so that the changes produced by alkalies and by acids can be observed with greater precision even than in daylight.

Alizarin as an Indicator of Acid and Alkaline Reactions in Titrimetric Estimations. Eugen School. (*Ber. der deut. chem. Ges.*, 1873, 1180.)

* A fuller description of some of the opium alkaloids will be found in the *Year-Book of Pharmacy*, 1872, 228.

The author found that extremely dilute solutions of acids or alkalies, which fail to affect the colour of litmus, will produce a distinct change in the colour of a neutral solution of alizarin; and he therefore recommends the application of the latter in place of tincture of litmus for alkalimetric and acidimetric estimations.

The test solution is prepared by boiling an excess of alizarin with solution of caustic potash and a drop of carbolic acid, and filtering, when cold, from the undissolved alizarin. This solution has a purplish red, or if very weak a pinkish red, colour, which changes to yellow as soon as it is added to any acid liquid; and the yellow colour thus produced is again changed into pink by the least trace of free alkali. Strips of paper soaked separately in this solution, and in a solution of alizarin in alcohol, may be used in place of blue and red litmus paper.

Chloroform as a Solvent for Vegetable Poisons. J. Nowak. (*Archiv. der Pharm.*, 3rd series, iii., 281.)

The following alkaloids are taken up rapidly and completely from alkaline solutions by chloroform:—Strychnine, quinine, cinchonine, caffeine, theobromine, emetine, atropine, hyoscyamine, aconitine, veratrine, physostigmine, narcotine, codeine, thebaine, nicotine, and coniine. Brucine, colchicine, and papaverine, are dissolved more slowly, and sabadilline only by the aid of heat. Narceine is but sparingly dissolved, and picrotoxin is taken up more rapidly from acid than from alkaline solutions. Morphine and solanine are quite insoluble in chloroform.

Coloration of Chloral Hydrate by Oil of Peppermint. Dr. C. Jehn. (*Repertor. der Pharm.*, 1873, 434.)

The author has observed that chloral hydrate in contact with oil of peppermint becomes reddened, and soon assumes a dark cherry-red colour, which it yields to ether, alcohol, or chloroform. An addition of sulphuric acid increases this colour, and a subsequent addition of chloroform changes it to dark violet. The cause of this coloration is not yet understood. The reaction seems to be peculiar to oil of peppermint, as the author failed to produce it with any other essential oil, though he tried the experiment with a great many.

Solvent Action of Chloroform on the Sulphates and Hydrochlorates of the principal Cinchona Alkaloids. O. Hesse. (*Pharm. Journ.*, 3rd series, iv. 649; from *Neues Jahrb. f. Pharm.*, Sept. 1873, 130.)

The author states that pure chloroform is an excellent separatant of these alkaloids, some being easily soluble in it, whereas others are difficultly soluble.

According to his experiments, the following are the quantities of chloroform (1.492) required to dissolve one part of anhydrous sulphates of,

	Quinine.	Cinchonidine.	Conchinine.	Cinchonine.
At 61–62° C. . .	196 . . .	300 . . .	9 . . .	22.4 parts.
At 15° C. . .	about 1000 .	about 1000 .	19.5 . .	60 „

On evaporation of the chloroform solution of these salts at a gentle heat, the quinine and cinchonidine sulphates remain behind in crystals, whilst the conchinine and cinchonine sulphates are obtained as a transparent amorphous mass.

If, therefore, quinine sulphate (one gramme) when agitated with pure chloroform (15 c.c.) gives a solution which on evaporation leaves a transparent amorphous residue, it follows that conchinine or cinchonine sulphate is present. If these salts are not present the residue of the evaporation is crystalline. When pure quinine sulphate is thus treated, 10 c.c. of the chloroform solution pass easily through a small plaited filter, and on evaporation (at 30–40°) the filtrate yields not more than 35 mgr. of crystalline residue. With cinchonidine sulphate, or a quinine sulphate containing a considerable quantity of this salt, it is impossible to obtain 10 c.c. of filtrate from the mixture, on account of the swelling up of the cinchonidine sulphate. The latter is converted into extremely fine needles, which soak up the chloroform solution like a sponge, and do not yield it again without pressure.

If the residue is crystalline, and does not amount to more than 35 mgr. from 10 c.c. of solution, the absence of conchinine and cinchonine sulphates may be determined by heating this residue with about 5 c.c. of water, adding 0.5 gramme of potassium-sodium tartrate, removing the precipitated quinine or cinchonidine tartrate by filtration after cooling, and mixing the filtrate with an equal volume of officinal solution of ammonia. If no conchinine or cinchonine salt is present the solution remains clear, but in the other case a precipitate is formed.

On treatment with pure chloroform, cinchonidine sulphate is quickly deposited in extremely delicate prisms, and on this account is bulky. Only traces of it are taken into solution, the greater part remaining in the undissolved residue. The salt is easily detected in this residue (after removal of the adhering chloroform solution by pressing between folds of bibulous paper) by means of Kerner's test, *i.e.*, 5 c.c. of the watery solution mixed with 7 c.c. of officinal liquor ammoniæ will cause more or less turbidity, which eventually resolves itself into a crystalline yet flocculent precipitate.

In pure chloroform, then, we have an excellent means of rapidly deciding in a given case whether "quinidine sulphate" (as cinchonidine sulphate containing quinine is generally termed) contains conchicine or cinchonine sulphate, or is perhaps the conchicine salt only. The latter would be the case if, for example, 0.5 gramme of the salt dissolved with ease in 7 c.c. of pure chloroform. Since, then, the "quinidine salt," called conchicine sulphate by Hager, dissolves only slightly in pure chloroform, it certainly contained no conchicine sulphate.

According to Cullen and others, cinchonidine sulphate is an excellent febrifuge, but is excelled in this respect by quinine sulphate. On account of its low price it might be more extensively prescribed for the poor, and generally where, on other grounds, great expense is not advisable. On this account the author regrets the omission of it from the German Pharmacopœia.

Chloroform usually contains a small proportion of alcohol, which, as is well known, renders it more stable. A trifling difference in the amount of alcohol makes itself apparent in the proportion of quinine or cinchonidine sulphate dissolved, and on this account is allowed a residue of 55 mgr. for 10 c.c. of solution, which more than corresponds to the solubility of both salts. This number is not arbitrarily chosen, but has been ascertained by experiments with quinine sulphate which answered the tests of the Pharmacopœia. A chloroform which contains more alcohol than is generally the case, dissolves a correspondingly larger proportion of quinine and cinchonidine sulphates. Six parts of a mixture of two volumes chloroform and one volume absolute alcohol dissolves as much as one part of quinine sulphate $2\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}_2, \text{H}_2\text{SO}_4 + 7\frac{1}{2}\text{H}_2\text{O}$ at 18°C . Cinchonidine sulphate also dissolves very readily in this mixture, which the writer uses in examining quinine sulphate for the sulphates of sodium, magnesium, and calcium and other inorganic substances, salts of ammonium, mannite, cane-sugar, milk-sugar, and starch, since these do not dissolve in the mixture. Salicine itself is separated by it, if present in greater quantity than 1 per cent. One gramme of sulphate is introduced into a test-tube, and 7 c.c. of the mixture are added. (Only 5 c.c. are requisite for solution, but 7 c.c. are ordered to compensate for unavoidable loss of solvent). The contents of the tube are shaken once round, the tube is corked, and allowed to stand aside for about ten minutes; at the end of this time, if the salt is pure, it is entirely dissolved, leaving only a few fibres of paper, introduced in the drying of the salt, suspended in the solution; these finally settle to the bottom, and are of course dis-

regarded. But if the salt contain an admixture of any of the above-cited substances, these also subside to the bottom of the glass, and may then be known, in part, by their form. To determine them quantitatively it is only necessary to throw the mass upon a small filter, and afterwards to wash them with a little of the pure mixture.

This operation may be supplemented by the ignition test, which, since the carbon of quinine burns away with great difficulty, is an exceedingly protracted operation, and not unfrequently has led to misapprehension. A case recently came under the author's notice, in which absolutely pure sulphate of quinine was said to contain sugar, or other difficultly combustible substance, because the operator could not succeed in burning away the carbonaceous residue of the quinine.

Of the remaining salts of these alkaloids, the author cites only the neutral hydrochlorates, which, without exception, dissolve very readily in pure chloroform, giving up to it their water of crystallization. On this latter account these salts should be previously dried at 100°C . At 15°C , anhydrous hydrochlorate of quinine dissolves in about an equal weight of chloroform.

The hydrochlorates of cinchonine and cinchonidine present this curious phenomenon—these salts dissolve indeed instantly in the chloroform, but the solution, after a short time, and at the original temperature, becomes thick and crystalline, owing to the formation of difficultly soluble compounds of the salts with the solvent. In such compounds, one part of cinchonidine hydrochlorate requires 13 parts of pure chloroform at 20° , and one part of cinchonine hydrochlorate requires 22.2 parts of pure chloroform at 15°C ., for solution. On evaporation of the solution the cinchonine hydrochlorate remains behind as an amorphous resinous mass, which, without increase of weight, gradually changes into radiating crystals. It is the anhydrous substance $\text{C}_{20}\text{H}_{24}\text{N}_2\text{O}, \text{H Cl}$. The different behaviour of quinine sulphate and cinchonine hydrochlorate with pure chloroform furnishes a ready and convenient method of detecting the latter salt when mixed with the former.

Finally, most cinchona barks, when treated with pure chloroform, yield a small quantity of alkaloids to it. The method devised by Bernatzik for the discovery of a falsification of cinchona bark with quinoidine is therefore useful only under certain limitations.

Detection of Quinine in Urine. Dr. Vitali. (*Journ. de Pharm. d'Anvers*, xxx., 57; from *Giornale della Società di Farmacia di Torino*.) The author proposes the following method:—Add five or six cubic centimetres of ether to about eight or ten cubic centimetres of urine;

to this mixture add eight to ten drops of ammonia, or of a solution of caustic soda, and, after agitation, allow to stand. When the ether has separated out from the liquid, abstract it with a pipette, and evaporate it at a gentle heat, with one drop of pure hydrochloric acid in a small capsule. After cooling, pour into the capsule one or two drops of strong chlorine water, and stir with a glass rod until the almost invisible residue has been dissolved, then add one drop of ammonia.

If the urine contains five centigrams of the alkaloid per litre, the characteristic green colour will be seen. A beautiful reddish purple will be produced by adding to the residue one drop of yellow prussiate, one or two drops of chlorine water, and a drop of ammonia, if the urine contains the above mentioned amount of quinine.

Detection of Mercury in Urine. Mayençon and Bergeretn. (*Chem. Centralblatt*, 1873, 678.) An iron nail, to which a piece of platinum wire is attached, is suspended in the urine, and a sufficient quantity of pure H_2SO_4 added to produce a slow current of hydrogen. Within half an hour the mercury becomes deposited on the platinum wire, and may be detected by washing the latter in a current of water, and exposing it to the action of chlorine in order to convert the Hg into HgCl_2 . If now the wire is drawn across a piece of filtering paper, slightly moistened with a solution of KI (containing 1 per cent.), a red line caused by HgI_2 will be produced, which will disappear on the addition of a little more solution of KI .

Detection of Blood in Urine. Prof. Almén. (*Neues Jahrb. für Pharm.*, xl., 232.) A few c.c. of tincture of guaiacum are shaken in a test-tube with an equal volume of oil of turpentine until an emulsion is formed; to this the urine is added carefully, so that it will sink to the bottom. Under ordinary circumstances, the resin of guaiacum will separate as a white precipitate, which after a while becomes yellowish white or greenish. But if the urine contain blood, though it be only a trace, the resin will show a distinct blue colour, the intensity of which depends on the quantity of blood present. Pus, albumen, and other abnormal and normal constituents of urine, do not produce this blue coloration.

Volumetric Estimation of Bismuth. MM. Buisson and Ferray. (*Moniteur Scientifique*, 3rd series, iii., 900.) The complete precipitation of bismuth from acetic solutions by means of iodic acid forms the basis of a new volumetric method, which, though applicable to all bismuth compounds, is recommended by the author principally for the estimation of Bi in the subnitrate, as this pre-

paration frequently contains oxychloride, besides other impurities and adulterants. The examination of the subnitrate is conducted in the following manner:—

A solution of 0.5 gramme of the salt in a few drops of HNO_3 is diluted with a small quantity of water, and then mixed with sufficient solution of NaHCO_3 to form a slight permanent precipitate; this precipitate is dissolved in an excess of acetic acid, and the iron or oxychloride of bismuth which may be present removed by boiling and filtering (the oxychloride being insoluble in acetic acid). The filtered liquid is mixed with 25 c.c. of the solution of iodic acid, and with sufficient water to make up 250 c.c.; the mixture, after being well shaken, is allowed to stand for a few minutes, and then passed through a dry filter. 100 c.c. of the clear filtrate are now acidified with dilute H_2SO_4 , and mixed with a sufficient quantity of KI to decompose the excess of iodic acid, and to dissolve the liberated iodine. A standard solution of hyposulphite of sodium is then added until the mixture appears colourless; the number of c.c. required indicates the quantity of the liberated iodine, from which the amount of iodic acid used in excess, and consequently that required for the precipitation of the bismuth, may be calculated.

The solution of iodic acid is prepared by dissolving 30 grammes of the crystallized acid in a litre of distilled water; its strength is tested by dissolving a weighed quantity of pure metallic bismuth in HNO_3 , and treating the solution with NaHCO_3 , and $\text{HC}_2\text{H}_3\text{O}_2$, etc., as before.

The solution of hyposulphite of sodium is best made of such a strength that 30 c.c. of it discharge the colour of the iodine liberated by 10 c.c. of the solution of iodic acid.

The reagents employed should be free from chlorine, as otherwise some oxychloride of bismuth would be formed, which is insoluble in acetic acid, and would thus render the result inaccurate. The iodide of potassium ought to be free from iodate.

Preparation of Various Test-Papers. Dr. F. Mohr. (*Zeitschr. f. analyt. Chem.*, 1873, 368.) Litmus and turmeric papers being almost the only test-papers in common use, the author thinks that the application of prepared papers for chemical tests might be advantageously extended to a greater variety of substances than has hitherto been done. He suggests a number of instances of this kind:—

1. Strips of filtering paper, soaked in a weak solution of sulphocyanide of potassium, and dried, will be stained red by solutions of ferric salts.

2. Filtering paper soaked in a solution of ferrocyanide of potassium serves for the detection of ferric and cupric compounds, forming a blue stain with the former and a brownish red one with the latter.

3. White writing paper (sized with starch), when soaked in a solution of iodate of potassium and oxalic acid, and dried, may be employed for the detection of reducing agents, such as sulphites, hyposulphites, sulphuretted hydrogen, sulphocyanides, ferrocyanides, ferrous salts, cuprous salts, iodide of potassium, etc., all of which will stain this test-paper blue.

4. The same kind of writing-paper as used in 3, when soaked in a solution of iodide of potassium, may be used for the detection of oxidizing agents, such as chlorine, bromine, iodine, chromic acid, ferric salts, cupric salts, nitrous acid, ozone, etc., which turn it blue.

5. Filtering paper soaked in a weak solution of mercurous nitrate will be blackened by ammonia gas. This mode of testing for NH_3 has been previously recommended by Otto.

6. Filtering paper soaked in a solution of acetate of lead is already in general use for the detection of sulphuretted hydrogen.

7. Writing paper which is covered with moist sulphide of zinc, as prepared by precipitation from a solution of acetate of zinc by H_2S , serves for the detection of those metals which can be precipitated by H_2S from acid solutions. Any mineral acid acting upon this layer of sulphide of zinc evolves H_2S , which at once throws down the sulphide of the metal present, thus producing a coloured stain on the paper. This test-paper is termed by the author a sulphuretted hydrogen apparatus which may be carried in the waist-coat pocket.

Test for Morphia. H. Kalbruner. (*Zeitschr. des oesterr. Apotheker Vereins*, ii., 469.) The author has subjected Kieffer's test for morphia to a close examination. He operated with a solution of ferric chloride containing 30 grains of the crystallized salt in four drachms of water, and a solution of two grains of ferricyanide of potassium in four drachms of water.

A small quantity of the liquid to be tested for morphia is mixed with five or six drops of the solution of ferric chloride, and subsequently with three or four drops of the solution of ferricyanide. If no blue coloration ensue, morphia is either absent or it amounts only to an exceedingly small trace.

A solution containing $\frac{1}{4000}$ of hydrochlorate of morphia, gave an intense dark blue coloration immediately.

With $\frac{1}{7000}$ the coloration was light blue.

A solution containing $\frac{1}{14000}$ of the same morphia salt produced a bluish green coloration, which changed into dark blue after some time. This degree of dilution may be considered as the limit of the reaction.

A large excess of free acid interferes with the reaction. The test solution should be kept in a dark place.

Reaction of Sugar and Sulphuric Acid upon some Alkaloids. R. Schneider. (*Poggendorf's Annalen*, cxlvii., 128.)

Morphia. If a few milligrammes of a mixture of one part of morphia and six to eight parts of sugar are added to one drop of pure concentrated H_2SO_4 placed on a slab, it will at once assume a purplish red colour which remains for some time (a quarter to half an hour), and then changes through bluish violet and bluish green to yellow. These latter changes are due to the absorption of moisture by the sulphuric acid. This reaction will take place with as little as $\frac{1}{100}$ of a milligramme of the alkaloid. If morphia is to be detected in a solution of one of its salts, one drop of the solution should be saturated with sugar in a porcelain dish, and a drop of concentrated sulphuric acid, which is placed close to, carefully united with it by inclining the dish; a distinct pink zone will be observed where the two drops meet.

Codeine produces the same coloration as morphia, but the reaction with this alkaloid is most distinct if a somewhat diluted sulphuric acid is used for the experiment. The test is best performed by pouring upon the alkaloid a few drops of a moderately concentrated solution of sugar, and then adding a few drops of sulphuric acid. As codeine is readily taken up from alkaline solutions by chloroform, while morphia is not, these two alkaloids are not likely to be confounded with each other.

Narceine and *Narcotine* and the other opium alkaloids produce no characteristic reaction with sugar and sulphuric acid. The same may be said of strychnine, brucine, atropine, colchicine, emetine, picrotoxin, and the cinchona alkaloids.

Aconitine. If about one milligramme of aconitine is suspended in one drop of a moderately concentrated solution of sugar, and then carefully united with one drop of sulphuric acid, a distinct pink zone is produced where the two liquids meet, and this passes rapidly through violet to brown. This reaction is very sensitive and characteristic. Codeine can be readily distinguished from aconitine by its great solubility in hot water.

Delphinine. This alkaloid, when treated with a solution of

sugar, and with H_2SO_4 , in the same manner as the aconitine, produces a yellow or yellowish brown spot, which gradually becomes surrounded by a narrow dirty greenish zone. If now one drop of water be added, the brown colour will change to a beautiful green, a change which is highly characteristic of this alkaloid.

Chelidonium, when treated in the same manner as the two preceding alkaloids, produces a play of colours very similar to that produced by the action of bichromate of potassium and sulphuric acid upon strychnine.

In reference to these reactions, it must however be borne in mind that proteids and many fatty oils will show a similar behaviour to sugar and sulphuric acid as the above named alkaloids.

The Composition of Cascarillin. C. and E. Mylius. (*Ber. der. deut. chem. Ges.*, 1873, 1051.) It is well known that cortex cascarillæ contains a crystallizable bitter principle, which has been called cascarillin by its discoverer Duval. R. V. Tuson has drawn attention to the great similarity between cascarillin and ricinin, a base occurring in the seeds of *Ricinus communis*.

The authors found that a solution of extractum cascarillæ in water deposits a white globular substance very similar to inulin. By recrystallizing the substance repeatedly from alcohol, it was obtained in the shape of white microscopically small prismatic needles, having a very bitter taste, and melting at $+205^\circ$. It is hardly soluble in water, cold alcohol, or chloroform, but readily soluble in ether and hot alcohol. 100 pts. of water at 100°C . dissolve 0.127 pts. of the crystals; 100 pts. of alcohol at 8°C . dissolve 3.33 pts. The properties of the substance were found to be identical with those of Duval's cascarillin. Further experiments also confirmed the statement that cascarillin dissolves in sulphuric acid, forming a dark red coloured solution, which, on addition of water, throws down a green flocculent precipitate. It was impossible, however, to obtain a coloured solution with hydrochloric acid. Cascarillin cannot be sublimed, but decomposes on heating, leaving a carbonaceous residue, which is difficult to incinerate.

The following facts suffice to dispel the idea of any real similarity between cascarillin and ricinin. The latter is a strong base, whereas the former is quite indifferent in its behaviour both to acids and alkalis; moreover it contains no nitrogen. The analyses led to the empirical formula $\text{C}_6\text{H}_9\text{O}_2$, which, of course, should be doubled.

Calculated.			Found.			
			I.	II.	III.	IV.
C ₆	72	63·71	62·62	63·72	64·02	63·64
H ₉	9	7·97	7·99	8·02	8·07	8·14
O ₂	32	28·32	—	—	—	—
	113	100·00				

The authors did not succeed in establishing its rational formula by the preparation of derivatives. Bromine acts energetically upon cascarillin, forming a resinous product, which could not be obtained in a pure state. The analysis of the nitro compound formed by the action of fuming nitric acid also failed to give satisfactory results. Cascarillin is not decomposed by boiling with dilute acid; hence it is no glucoside.

Estimation of Sugar by means of Iron. M. Riffard. (*Journ. de Pharm. et de Chim.*, 1874, 49.) Sugar, like tartaric, malic, and citric acid, and albumen, prevents the precipitation of iron by ammonia. A solution containing sugar and iron in a certain proportion, when saturated with ammonia will form a compound of a fine red colour, which remains clear, if no alkaline earthy metals be present.

The author has applied to sugar the method proposed by M. Juette for the estimation of tartaric acid. He observed that a neutral or acid solution of crystallized perchloride of iron, when heated for a considerable time to 100° C., requires 2·710 grammes of sugar, if 100 milligrammes of iron are to remain in solution in the presence of ammonia. If, on the other hand, the solution is prepared simply by dissolving crystallized perchloride of iron in pure water, without the addition of an acid, 100 milligrammes of iron only require 2·587 grammes of sugar, to remain dissolved. In this case the liquid is perfectly clear, and remains so; but if a smaller quantity of sugar be added, it is turbid, and deposits peroxide of iron.

To estimate the sugar by this process, 25·870 grammes of the substance to be tested are dissolved, the solution mixed with a few drops of oxalate of ammonia to precipitate the lime, filtered, and made up with water to 250 c.c., 25 c.c. of this mixture require the addition of as many milligrammes of iron as there are per cents. of pure sugar in the sample under examination, and by two tests the following results will be arrived at:

With n milligrammes of iron the solution is clear.

With $n + 1$ " " " precipitated.

n representing the number of per cents. of sugar contained in the sample.

Remarkable Reaction of Caustic Potash on Nitrobenzol. Prof. Merz and Dr. Coray. (*Repert. für Pharm.*, 1874, 244.) The authors observed that azobenzol is formed on heating a mixture of nitrobenzol and caustic potash. The reaction is a very violent one, and inflammable vapours are evolved in immense quantities.

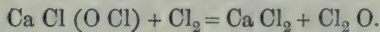
This experiment, when performed on a small scale, is well suited for the lecture-room. On heating a few c.c. of nitrobenzol with finely powdered caustic potash, in a long test-tube, and igniting the gases evolved, a flame of more than one foot in length is produced.

Estimation of Available Chlorine in Bleaching Powder. A. Vogel. (*Repert. für Pharm.*, 1873, 577.) The author states that the solution of As_2O_3 , as used in Gay-Lussac's process for estimating the available chlorine in bleaching powder, is subject to considerable changes, arising from the gradual conversion of As_2O_3 into As_2O_5 . He found that in a normal solution half the quantity of As_2O_3 became oxidized to As_2O_5 in the course of about a year. He therefore recommends that the standard solution, if kept for some time, should be tested by magnesia mixture. The formation of a precipitate ($\text{Mg N H}_4 \text{As O}_4$) would show that the solution has undergone such a change as to render it unfit for volumetric estimations.

The Chemical Constitution of Chlorinated Lime. C. Schorlemmer. (*Journ. of the Chem. Society*, for April, 1874; from *Ber. der deut. chem. Ges.*, vi., 1509.) The author was much surprised by reading a paper by Goepner, "On the Nature of Chloride of Lime," in which he revives Berthollet's view, that the bleaching compound contained in it, is simply a combination of lime and chlorine, and decomposed by acids into its constituents. Goepner says the statement met with in all handbooks, that a solution of hypochlorous acid is obtained when a solution of bleaching powder is distilled with a dilute acid, is a mistake; and the reason why the error has maintained itself so long is, that hitherto no reaction was known by which free chlorine and hypochlorous acid could be readily distinguished. Such a reaction has, however, now been discovered by Wolters, who has found that when chlorine-water is shaken with mercury, only mercurous chloride is formed, while with aqueous hypochlorous acid it yields a brown, crystalline oxychloride, which is readily soluble in hydrochloric acid. In employing this method for detecting hypochlorous acid in the liquid obtained by distilling bleaching powder with a small quantity of

hydrochloric or sulphuric acid, Goepner could not find a trace of hypochlorous acid.

In reply to this, the author remarks that Gay-Lussac, in his classical research "On the Compounds of Chlorine with Bases," recommends as a ready means for preparing a dilute solution of hypochlorous acid, to distil a solution of bleaching powder with dilute nitric acid. This experiment has since been repeated hundreds of times. Roscoe shows it every year in his lectures, and the laboratory students perform it in the course of their practical work. A perfectly colourless distillate is thus obtained, which is a much more powerful bleaching agent than freshly prepared chlorine-water. This is quite sufficient to show that the distillate contains hypochlorous acid. But why did Goepner fail in detecting it? Is it the fault of the analytical method? To decide this, hypochlorous acid was prepared by distilling a solution of bleaching powder with dilute nitric acid or sulphuric acid. On shaking the distillate with mercury, the brown oxychloride was formed in each case. Another argument against the existence of hypochlorite in bleaching powder Goepner finds in the fact that the chlorine used in the manufacture, always contains hydrochloric acid, and thus more calcium chloride is formed than would correspond with the formula Ca O Cl_2 . When bleaching powder is exhausted successively with small quantities of water, this excess of calcium chloride is found in the first solutions, while the following contain calcium and chlorine in the proportion corresponding with the above formula. This, however, only proves that bleaching powder is not a mixture of calcium chloride and hypochlorite, but that it contains the compound $\text{Ca} \begin{Bmatrix} \text{Cl} \\ \text{O Cl} \end{Bmatrix}$, or has the constitution which Odling has assigned to it. Williamson has shown that a solution of hypochlorous acid is also readily obtained by passing chlorine into a mixture of water and finely divided calcium carbonate, and distilling as soon as the carbonate is dissolved. In this reaction the above compound is probably also first formed and then decomposed in the following way:—



The Preparation of Hydrogen Peroxide. By Julius Thompson. (*Ber. der. deut. chem. Ges.*, 1874, 73.) As the decomposition which takes place when sulphuric acid acts on commercial hydrated peroxide of barium, proceeds in a very slow and incomplete manner, the author recommends the following improved method for preparing $\text{H}_2 \text{ O}_2$.

Finely powdered peroxide of barium is introduced into dilute hydrochloric acid until the latter is almost neutralized. In order to remove the metallic oxides and silica, baryta water is added to the filtered and cooled solution until a slight precipitate of $\text{Ba O}_2 (\text{O H})_2$ is formed. The solution is then filtered again, and treated with a sufficient quantity of concentrated baryta water, when crystalline hydrated peroxide of barium separates out. The precipitate, if well washed, may be kept in the moist state in air-tight vessels for a considerable time without suffering decomposition.

Hydrogen peroxide is formed by gradually introducing the moist barium peroxide into dilute sulphuric acid, stirring constantly. The reaction proceeds in a steady manner, with a moderately dilute sulphuric acid; the author recommends a mixture of one part of $\text{H}_2 \text{S O}_4$ to five parts of $\text{H}_2 \text{O}$. The addition of the barium peroxide is continued until the acid is almost neutralized, whereupon the greater part of Ba S O_4 settles down, and is removed by filtration. The small excess of $\text{H}_2 \text{S O}_4$ contained in the filtrate may be removed by the careful addition of very dilute baryta water. In this manner a pure and tolerably strong solution of hydrogen peroxide may be prepared in the course of an hour.

Purification of Oxalic Acid. By F. Stolbo. (*Zeitschr. für analyt. Chem.*, 1874, 50.) The author recommends the following method for preparing a perfectly pure oxalic acid from the commercial article. The acid to be purified is dissolved in a sufficient quantity of boiling hydrochloric acid (containing 10–15 per cent. of H Cl) and the solution continually stirred whilst it is cooling. The small crystals thus formed are separated from the mother-liquor, and washed with water until the washings produce but a slight turbidity with Ag N O_3 ; they are then recrystallized from boiling water, the formation of large crystals being again prevented by stirring the solution as it cools. After separating the crystals from the mother-liquor, they are again washed with water, and then dried between folds of filtering paper. Oxalic acid thus purified does not leave the least residue when ignited in a platinum crucible.

Note on Solanine. By O. Bach. (*Neues. Jahrb. für. Pharm.*, August, 1873, 102.) The author prepared a quantity of this alkaloid from the shoots of potatoes, by precipitating it from the solution by ammonia, dissolving the precipitate in alcohol, and allowing it to crystallize from this solution by spontaneous evaporation. Finding that but few crystals were formed, and that the greater part of the alkaloid separated in the form of a jelly, he redissolved the latter in a little H Cl , again precipitated by ammonia, dissolved the precipi-

tate in alcohol, and allowed to crystallize as before. This time a larger quantity of the alkaloid crystallized out. The portion which again separated in a gelatinous form was repeatedly treated in the same manner as before, until the entire quantity of the solanine was obtained in a crystallized state. These crystals were found to be almost insoluble in water and ether, slightly soluble in cold and more so in hot alcohol. They are readily soluble in acids, forming salts, which gelatinize upon the evaporation of their solutions, so that they cannot be obtained in a crystalline state.

The author strongly recommends Helwig's test for the detection of solanine. On adding a trace of this alkaloid, to a warm mixture of equal volumes of alcohol and strong sulphuric acid, a cherry red colour is produced, which lasts for several hours. The presence of morphia does not interfere with this reaction, and this is an important feature of the test, as morphia and solanine are the only alkaloids which are not taken up by ether from either acid or alkaline solutions.

Solubility of Ozone in Water. By E. Schöne. (*Pharm. Centralhalle.*) The question whether or not ozone is soluble in water has been frequently discussed. Carius and Williamson have confirmed its solubility, which, however, is again denied by Rammelsberg, who found that water, through which ozone had been conducted, did not give the faintest indication of the presence of that substance.

The author arrives at the conclusion that the water used in Rammelsberg's experiments must have contained nitrogen, which by the action of ozone would become converted into nitric acid. He passed a large quantity of pure oxygen (obtained by electrolysis) through water in order to expel any nitrogen present, and then decomposed the water by electrolysis, thus obtaining oxygen quite free from nitrogen. The amount of ozone present in the gas as well as in the water was determined by means of a neutral solution of KI and $Na_2S_2O_3$, and the following results were obtained. Ozone, when passed through water is partially destroyed. When ozonized air is passed through water, the quantity of ozone is diminished by one fourth. Cold water and water of ordinary temperature absorb ozone, which is distinctly recognizable in the solution. The diminution of ozone as it is passed through water must be attributed to the decomposing action of water upon the gas. No hydrogen peroxide is formed by the action of ozone on water. When ozonized oxygen is kept in contact with water for some time, it becomes gradually converted into ordinary oxygen, and this change is accompanied by

an increase of volume. Most of the so-called ozonized waters contain hypochlorous acid but no ozone.

Oil of Wormwood. E. Beilstein and A. Kupffer. (*Ber. der deut. chem. Ges.*, 1873, 1183.) According to Leblanc, the principal constituent of the essential oil of *Artemisia Absinthium*, L., consists of a liquid isomeride of camphor, boiling at 204°C . In addition to this, Gladstone detected in it a hydrocarbon and an oil of a deep blue colour, which he considers to be identical with the blue coloured substance contained in oil of chamomile and oil of yarrow.

On rectifying the commercial oil of wormwood, the following products were obtained.

1. A *terpene* boiling below 160°C .
2. *Absinthol* $\text{C}_{10}\text{H}_{16}\text{O}$ boiling at 195°C .
3. A deep blue coloured oil, boiling between 270°C . and 300°C ., and identical with the blue oil of chamomile, examined by Kachler, who states that this oil is identical also with the blue coloured distillation product of *Galbanum*, and that it consists of a mixture of a *terpene* and a polymeride of camphor.

Absinthol differs very much from isomeric camphor. With nitric acid it produces no camphoric acid; when fused with caustic potash much resin but no acid is formed, and with sodium and carbonic acid no camphocarbonic acid could be obtained (Baubigny). With sulphuretted phosphorus, however it forms a considerable amount of cymol, which is perfectly identical with the cymols of cumin oil and camphor.

Boiling part of cymol of wormwood oil = 175°C .; spec. grav. 0.8707 at 0°C .

Three salts of the sulpho acid were examined. viz.:—

1. The barium salt $(\text{C}_{10}\text{H}_{13}\text{SO}_3)_2\text{Ba} + 3\text{H}_2\text{O}$, forming shining scales, which do not part with their water of crystallization in an exsiccator. 2.877 parts of salt dissolve in a 100 pts. of water at 15.8°C .
2. The lead salt, $(\text{C}_{10}\text{H}_{13}\text{SO}_3)_2\text{Pb} + 3\text{H}_2\text{O}$; and
3. The calcium salt, $(\text{C}_{10}\text{H}_{13}\text{SO}_3)_2\text{Ca} + 2\text{H}_2\text{O}$, forming large tabular shining crystals.

From these experiments it appears probable that cymols of different origin, such as the cymols obtained from the oils of *Cicuta virosa*, Trapp, *Ptychotis ojowan*, Hugo Müller, and turpentine, coincide with the one above mentioned, a view which is strongly corroborated by the researches of Deville, C. G. Williams, Barbier, Oppenheim, and Kekulé.

Notes on Cumic Acid. Beilstein and Kupffer. (*Ber. der deut.*

chem. Ges., 1873, 1184.) This acid may be advantageously obtained by adding oil of cumin drop by drop to fused caustic potash until the evolution of hydrogen ceases. Water is then added, the cymol removed by distillation, and the cumic acid precipitated from the alkaline solution by hydrochloric acid. It may be purified by precipitating it from its calcium salt by HCl. Its melting point is 114°C .

The Barium Salt, $(\text{C}_{10}\text{H}_{11}\text{O}_2)_2\text{Ba} + 2\text{H}_2\text{O}$, forms small laminar crystals of a pearly lustre, which do not part with their water of crystallization when dried over strong sulphuric acid. 100 pts. of H_2O dissolve 0.996 pts. of anhydrous salt at 20.5°C .

The Calcium Salt, $(\text{C}_{10}\text{H}_{11}\text{O}_2)_2\text{Ca} + 5\text{H}_2\text{O}$, forms semi-globularly grouped tufts of shining needle-shaped crystals, which effloresce on exposure to air, and lose two molecules of water of crystallization when dried over strong sulphuric acid.

100 pts. of H_2O dissolve 0.810 pts. of the anhydrous salt at 20.5°C .

The Magnesium Salt, $(\text{C}_{10}\text{H}_{11}\text{O}_2)_2\text{Mg} + 6\text{H}_2\text{O}$, forms delicate, laminar crystals of a pearly lustre, which lose no water of crystallization over strong sulphuric acid. 100 pts. of water at 20.5°C . dissolve 0.825 pts. of the anhydrous salt.

Detection of Nitrates in Water by Brucine. Prof. Böttger. (*Repertor. d. Pharm.*, xxiii. 120.) The author strongly recommends Reichardt's test for the detection of nitrates in water, which can be performed in a very short time, and requires but a few drops of the water to be tested, owing to the extreme sensibility of the reaction. Three drops of the water are mixed with two drops of a solution of brucine in a small porcelain dish, and from two to five drops of chemically pure sulphuric acid are added. A red coloration of the mixture shows the presence of nitrates. If the nitrates amount to an exceedingly small trace, it may be necessary to evaporate the water to one fourth of its volume before applying the test.

Manufacture of Chloral Hydrate. G. Detsényi. (*Neues Jahrb. der Pharm.*, xl, 160; from *Polytechn. Journal*, 209, 224.) Large earthenware vessels are half filled with dioxide of manganese, and a steady current of chlorine produced by the gradual addition of hydrochloric acid. The chlorine is washed with water, and passed into carboys, each of which contains 120 to 150 pounds of alcohol of 96 per cent. Each of these carboys is connected with another one, intended for the absorption of the HCl which is formed in considerable quantities. The passing of chlorine through the alcohol is continued night and day until the density of the resulting com-

pound is 41° Baumé, or until its temperature has risen to 60.75° C. The chlorinated alcohol is then placed into copper stills lined with lead, and holding about 400 pounds each, mixed gradually with an equal volume of H_2SO_4 , and carefully heated to the boiling point; whereby a considerable quantity of HCl is given off, while any chloral which becomes volatilized is condensed in an upright cooler, from which it runs back into the still. This operation, during which any chloral alcoholate is destroyed, is carried on until the evolution of HCl has ceased; the upright cooler is thus removed and the chloral distilled, the still having been provided with a thermometer. The liquid boils at $95-96^{\circ}$ C., and as soon as the boiling point rises to 100° C., the distillation is interrupted, as all the chloral has then passed over. The distillate is treated with carbonate of calcium to neutralize any HCl which may still be present, and then rectified from smaller copper stills provided with thermometers. The chloral which passes over is collected in glass receivers, shaken with the requisite quantity of water to form the hydrate, which is then either crystallized from chloroform, or poured into large shallow porcelain dishes, in which it solidifies in the course of about half an hour, forming cakes, which are broken into small fragments.

The crystallization from chloroform requires fully eight days. The mother-liquor which is separated from the crystals is always used again instead of chloroform for crystallizing fresh portions of chloral hydrate.

Eucalyptol. A. Faust and J. Homeyer. (*Pharm. Centralhalle*, xv., 65.) Some years ago Cloëz published his researches on eucalyptol, the principal constituent of the essential oil of *Eucalyptus globulus* (*Comptes Rendus*, March 28th, 1870; *Year-Book of Pharmacy*, 1870, 126). In distilling this oil, that author found that it began to boil at 170° , the temperature then rising rapidly to 175° , at which it remained stationary until half of the oil had passed over; a further part distilled at 188 to 190° , and another small portion at 200° . The fractions which passed over between 170° and 178° were treated with dry CaH_2O_2 and fused CaCl_2 , and then rectified. In this manner he (Cloëz) obtained a thin colourless liquid boiling at 175° which he called eucalyptol, and for which he found the formula $\text{C}_{12}\text{H}_{20}\text{O}$. He considered this substance as analogous to camphor.

The authors of the present essay have prepared a large quantity of eucalyptol according to Cloëz's process from 3 kilograms of the oil. 1000 grams of the oil were used for each experiment. The thermometer rose rapidly to 175° , and 450 grams passed over be-

low 180° ; 225 grams distilled at 180° to 183° ; 62 grams at 183° to 186° , and 90 grams at 186° to 200° . The rest distilled between 200° and 245° , leaving 50 grams of a resinous residue in the retort. The 827 grams which passed over below 186° were united, and separated into three parts by fractional distillation. The first part, being very small in quantity, boiled at 150° ; the second or principal part passed over between 176° and 180° , and the third at about 200° . The second portion, which amounted to 600 grams, was repeatedly subjected to fractional distillation, but it was found impossible to obtain a distillate of a constant boiling point. Upon treating this portion with dry CaH_2O_2 , and redistilling it, by far the greater part went over at 171° to 174° , the temperature rising towards the end to 178° ; but the same variations of temperature as before were observed during subsequent rectifications without the addition of lime. It was only by treating this eucalyptol with sodium, and then distilling it from sodium, that the author succeeded in obtaining the preparation at a nearly constant boiling point. The sodium hardly became tarnished by the action of the eucalyptol, which seemed surprising, as the latter had been stated to contain oxygen.

Eucalyptol boils between 171° and 174° . It is soluble in any proportion in ether, chloroform, or absolute alcohol, and in 15 parts of alcohol of 90 per cent. Its odour and general properties show that it is principally a terpene. A few drops of it when added to iodine cause deflagration. Exposed to the air, it absorbs oxygen, and resinifies, and this explains the circumstance that the boiling point of eucalyptol is not constant as long as this preparation is distilled without any addition, and that its boiling point rises the more, the oftener it is rectified. When mixed with sulphuric acid it becomes hot and brown, and on the subsequent addition of water, a thick adhesive mass is separated on the surface. All these properties belonging to the terpenes.

Upon boiling eucalyptol with nitric acid of 1.42 spec. gr., previously diluted with two parts of water in a retort with an upright condenser, paratoluic and terephthalic acids are formed. From 10 grams of eucalyptol the authors obtained 2.8 grams of paratoluic, and 0.8 grams of terephthalic acid.

The analysis of eucalyptol led to the formula $\text{C}_{10}\text{H}_{16}$.

<i>Calculated.</i>		<i>Found.</i>
C=88.23	. . . . .	C=88.74
H=11.77	. . . . .	H=11.48

The amount of carbon found was too high for a terpene, and that

of the hydrogen too low, showing that the terpene of this eucalyptol contained another hydrocarbon, of the same boiling point but with less hydrogen. In order to obtain this hydrocarbon, the authors polymerised eucalyptol by means of H_2SO_4 diluted with one fourth of water, according to Beilstein's method. After three days, during which the mixture was frequently shaken and warmed, it was distilled with water; and the oil which passed over along with the aqueous vapour was collected, and dried by chloride of calcium, and redistilled from sodium. This oil underwent no further change when again treated with H_2SO_4 . After repeated rectifications from sodium, it boiled constantly at 173° to 174° , and upon being analyzed it proved to have the composition of cymol. The preparation of the sulpho-acid and of its characteristic barium salt, $(\text{C}_{10}\text{H}_{13}\text{SO}_3)_2\text{Ba} + 3\text{H}_2\text{O}$, left no doubt that this hydrocarbon was cymol. Thus it appears certain that Cloëz's eucalyptol is a mixture of a terpene and a cymol.

Whether the paratoluic and terephthalic acids obtained from the so called eucalyptol by oxidation with dilute HNO_3 emanate merely from the cymol, or whether these acids are also obtainable in the same way from the terpene, now called eucalyptol by the authors, remains undecided, as the isolation of this pure eucalyptol from the cymol is impossible on account of the common boiling point of the two substances. The authors assume that the so-called eucalyptol does not contain more than 30 per cent. of cymol, and that its composition is represented by the formula $\text{C}_{10}\text{H}_{14} + 2\text{C}_{10}\text{H}_{16}$.

<i>Calculated.</i>		<i>Found.</i>
C=88.67	. . . . .	C=88.74
H=11.33	. . . . .	H=11.48.

Volumetric Estimation of Sulphuric Acid and Chlorine. E. Bohlig. (*Archiv der Pharm.*, 1874, 122.) The author proposes a very convenient and practical method for the determination of sulphuric acid and chlorine, which is especially useful in quantitative examinations of the commercial carbonates of potash and soda. The principle of this new method is the following.

The sulphates of the alkali-metals, when treated with water and carbonate of barium, are only partially converted into sulphate of barium and alkaline carbonates. In presence of free carbonic acid, however, this decomposition is complete, and it occurs still at a temperature of $50\text{--}60^\circ\text{C}$., at which a much smaller quantity of barium passes into solution as bicarbonate than in the cold.

After the action of the carbonic acid upon the mixture of alkaline

sulphate and barium carbonate, the alkali previously in combination with sulphuric acid will now exist in solution as bicarbonate, which, after removing the small quantity of barium contained in the solution as bicarbonate, by the addition of a little $\text{Ba H}_2\text{O}_2$, can be accurately estimated by titration with a normal standard solution of H Cl .

The chlorides of the alkali metals, with the exception of $\text{N H}_4\text{Cl}$, are readily decomposed at the ordinary temperature by shaking their solutions with carbonate of silver; after a short time all the chlorine is precipitated, and the alkaline carbonate now present in solution is estimated by means of a standard acid.

From the quantities of alkaline carbonates found, those of the original sulphates and chlorides are easily calculated.

These methods are applicable to any solutions of sulphates and chlorides which are free from, or which have been freed from heavy metals, oxalic acid, and phosphoric acid; but they seem to be specially adapted for the analysis of the carbonates of K and Na , as the above decompositions occur most readily in weak solutions of these carbonates. In such cases the alkaline carbonates, present as such, are first estimated by titration, after which the sulphates and chlorides are converted into and estimated as carbonates, by means of Ba CO_3 and Ag_2C , and subsequent titration.

The author quotes a number of experiments which prove that these methods are as exact as they are convenient and practically useful.

Solubility of Arsenious Acid in Water. L. A. Buchner. (*Neues Jahrb. der Pharm.*, xl., 301). The following are the results obtained by the author's experiments on the solubility of the crystalline and of the amorphous arsenious acid in water.

Found in one litre of a saturated solution prepared at 15°C .:—

Of the Crystalline Acid . . .	2.821 grammes.
„ Amorphous Acid . . .	9.306 „

Found in one litre of a saturated solution in boiling water after cooling and standing for 24 hours at 15°C .:—

Of the Crystalline Acid . . .	21.879
„ Amorphous Acid . . .	33.056

From these results the following numbers were obtained by calculation:—

1. 1 part of the crystalline acid is soluble in 355 parts of water at 15°C . when kept in contact with it for 24 hours.

2. 1 part of the amorphous acid requires 108 parts of water at the same temperature.

3. 1 part of the crystalline acid, when boiled with water, and then kept in contact with it at 15° C. for 24 hours, requires 46 parts of water to dissolve it.

4. 1 part of the amorphous acid, when treated in the same manner as in 3, is soluble in 30 parts of water.

Thus it appears that arsenious acid is subject to the same loss as other substances capable of assuming both a crystalline and an amorphous condition, viz., that such substances in the amorphous state are more soluble in their respective solvents than their crystalline modifications. It will also be found that the amorphous arsenious acid has a lower specific gravity than the crystalline. A solution of either modification in water or in a solution of carbonate of potash will of course produce the same medicinal effect, and it can therefore make no difference which of the two is used for Fowler's solution and similar preparations; but it is equally certain that amorphous arsenious acid, when taken internally in the solid state, will produce stronger poisonous effects than an equal dose of the crystalline acid.

Preparation of Carbonate of Magnesia from Dolomite. G. Lemoine. (*Bulletin de la Société d'Encouragement*, 1873, 362.) The author states that considerable quantities of carbonate of magnesia are now manufactured by Pattinson's process, which consists in the treatment of dolomite, suspended in water, with carbonic acid gas, under a pressure of 5-6 atmospheres, whereby the carbonate of magnesia is dissolved far more readily than the carbonate of lime. The solution of bicarbonate of magnesia is placed in vertical cylinders, and impregnated with steam, in order to throw down the magnesia as carbonate. The moist precipitate is formed into small square pieces, which are carefully dried.

A Process for the Analysis of Soap. A. Senier. (*Amer. Journ. Pharm.*, 4th series, iv., 353.) Three essential constituents are found in all soaps, viz., a base, a fatty acid, and water. Besides these, there is usually more or less glycerin, sometimes added intentionally, though generally due to imperfect separation; an excess of alkali and alkaline and earthy carbonates are commonly found, and sulphates and chlorides are of frequent occurrence. By the author's method the fatty acids, save resin, are estimated together. The base is estimated as soda in the case of hard soaps, and as potash in that of soft. The water is determined by subtracting the weight of all the substances found from the gross weight (it should not exceed 20 to 30 per cent.).

Average the soap fairly, and weigh out three portions—10 grams, 10 grams, and 40 grams.

Digest ten grams with alcohol (five or six ounces), heat over a water-bath, filter and wash the residue frequently with hot alcohol (the funnel being kept hot by a suitable apparatus for hot filtration). The residue and filtrate are to be treated as follows:—

1. *Residue.* (Carbonates, other salts, colouring matter, etc.)

Dry in an oven at 212° F., counterpoise the filter and weigh. Digest with hot water on the filter, and test the solution volumetrically by a standard normal solution of oxalic acid. Every c.c. used will indicate .053 grams of Na_2CO_3 . Incidentally notice whether any precipitate of calcic oxalate occurs. Subtract the weight of sodic carbonate from the whole weight of residue insoluble in alcohol, and the remainder is the weight of *salts* (alkaline sulphates and chlorides) and *foreign matter*. This can be further analyzed, if it is desired.

2. *Filtrate.* (Alcoholic solution of soap and free alkali.)

Pass through it a stream of carbonic acid gas; if a precipitate forms continue until the precipitation ceases; filter; dissolve the precipitate in water, and estimate with normal standard solution of oxalic acid, as before. Every c.c. indicates .031 grams of *free soda*, or .047 of *free potash*, as the case may be. No precipitate indicates the absence of free alkali.

The filtrate from the precipitate by carbonic acid, or, if no precipitate has occurred, the alcoholic solution, is mixed with about one ounce of water, and evaporated on a water-bath until all the alcohol is driven off. To the aqueous solution a normal solution of oxalic acid is then added, until it is acid to litmus paper. Each c.c. required indicates .031 grams *combined soda*, or .047 grams of *combined potash*.

A little sulphuric acid is now added, to separate the fatty acids more rapidly. Ten grams of beeswax—previously melted to free it from water—are added, and the whole placed on a water-bath until the fatty acids have mixed, forming a stratum on the surface of the liquid. The mixture is then set aside to cool, and the cake, or solidified stratum, removed, dried and weighed. Subtract the weight of the beeswax, and the remainder is the weight of *fatty acids and resin*.

1. Take 40 grams, dissolve in water, add dilute H_2SO_4 until the precipitation ceases, and set aside in a cool place (below 57° F.). The fatty acids will rise to the top, when they may be separated, dried, and weighed.

2. Shake the fatty acids with a mixture of equal parts of water and alcohol until the subsident liquid ceases to be milky. Weigh the fatty stratum again, and subtract from the weight obtained above, and the result is approximately the weight of resin in 40 grams. Divide by four, and the quotient is the weight of *resin*.

3. Determine the fusing point of the fatty acids.

Take 10 grams, dissolve in alcohol, add alcoholic solution of sulphuric acid until the precipitation ceases, and filter. Add baric carbonate, and filter again. Evaporate until the alcohol is all expelled, and weigh the remaining *glycerin*.

Add together the amounts found of carbonate, salts, and foreign matter, alkali (free), alkali (combined), fatty acids, resin, glycerin, and the difference between that sum and 10 grams, is the weight of water.

The Reactions of Acids with Oil of Peppermint, and their Bearing on the Formation of Chlorophyll. By M. A. Frebault. (Abstract of a paper in the *Répertoire de Pharmacie*, ii., 199; *Pharm. Journ.*, 3rd series, iv., 977.) With the object of combining the hydrocarbon of oil of peppermint with picric acid, the author heated gently together an alcoholic solution of that acid with some of the essential oil; water was added to dissolve the excess of acid, and the mixture left to stand. Twenty-four hours afterwards the oil, which had collected at the surface of the liquid, presented a magnificent green colour. This formed the starting point for the author's investigation.

Action of Picric Acid upon Oil of Peppermint.—If oil of peppermint be agitated with picric acid, nothing is observed at first further than that the picric acid partially dissolves, and communicates its yellow colour to the oil; but in half an hour the mixture is coloured manifestly green, and in 24 hours this coloration acquires a great intensity. If a slight heat be applied to the mixture the green colour appears more rapidly.

This green product, exposed to the air upon water during four or five days, acquires the reddish yellow colour of dead leaves. Introduced floating on water into a test-tube containing nitrogen, the colour is retained for some time; but in oxygen it disappears more quickly. Treated several times with cold water, the washings remove each time some of the picric acid, together with a red colouring matter, and finally the essential oil remains of a reddish yellow colour.

The green product has a strong red fluorescence, and in an alcoholic or ethereal solution this phenomenon is still more marked.

Treated with solution of caustic potash or ammonia, a picrate of the base employed is formed, and the essential oil remains of a reddish yellow colour. When the green product is distilled from caustic potash, a colourless liquid passes over into the receiver, and there remains in the retort a black mass analogous to that obtained by treating oil of peppermint with chromate of potash. The distillate no longer yields the green reaction with picric acid. Nascent hydrogen reduces the green product, and transforms it into a brown substance. If, instead of operating in the cold or with a gentle heat, the solution of picric acid in oil of peppermint is boiled for a few moments, it passes from the green state to yellow-brown, and then reddish brown. Upon the addition of ammonia it quickly forms red crystals, which are probably picramate of ammonia, and some crystals of picrate, whilst in the midst of them is disseminated an amorphous powder of a beautiful red colour. This red powder is soluble in water, insoluble in benzine and oil of turpentine, and very slightly soluble in ether and alcohol.

That oil of peppermint is a reducing agent is shown by its producing the characteristic colour of Prussian blue in paper saturated with a solution of ferric sulphate and ferricyanide of potassium. At the boiling temperature it partially transforms the perchloride of iron to the state of protochloride, and the perchloride of mercury is also partially reduced to calomel. Submitted to dialysis in alcoholic solution, the picric acid diffuses through from the green product, together, no doubt, with a little menthene, the solid and crystallizable portion of the essential oil. This solution has a bitter, sweetish, and slightly cool taste. Distilled in a water-bath it leaves a yellow residue, which, treated with sulphuretted hydrogen and ammonia, gives the intensely red coloration of picramate of ammonia. The alcoholic distillate has the cool taste of oil of peppermint due to the menthene.

It was thought interesting to investigate whether the reaction took place between the crystallizable portion or the hydrocarbide of the essential oil and the picric acid; whether the green reaction was also produced with oil of pennyroyal, which contains no stearoptene. The phenomenon of coloration was found to be limited to the oil of peppermint, except that it occurred also with oil of chamomile; but in that case there is no combination, the green being produced by the mixture of blue and yellow, and there is no red fluorescence.

The reaction between oil of peppermint and picric acid is so clear, that the author thought picric acid might be used in testing for the

presence of that essence in a mixture of essential oils, and *vice versâ*, that oil of peppermint would be a suitable test for the presence of picric acid. For this purpose he made a mixture of several essences, about two grams, to which he added two drops of oil of peppermint. This was shaken with a solution of 10 centigrams of picric acid in about 50 grams of water. At the end of 24 hours the essential oils collected on the surface, and presented a very perceptible green tint. In a second experiment, a decoction of barley and hops was made, to which an extremely small quantity of picric acid was added. The liquor was filtered, and a portion of it agitated with 50 centigrams of oil of peppermint in a test-tube. The green colour was very evident after 24 hours.

The author has made no experiments with beer, but he suggests that it might be tested by evaporating the suspected beer to the consistence of honey, treating the extract with alcohol to which a few drops of nitric acid have been added, filtering the liquid, concentrating and agitating with a little oil of peppermint. Nitric acid is used for the purpose of oxidizing any acid that may have been reduced to picramic acid by the action of sugar in the beer, and to saturate the lime salts present.

Action of other Acids on Oil of Peppermint.—The question as to what this coloration is due to may receive some elucidation from observation of the action of other acids upon oil of peppermint, which has not yet been carefully studied. The following are the principal effects noted by the author:—

Sulphuric Acid produced at first a rose colour, then reddish yellow, passing rapidly to reddish brown. When ether was added it acquired a beautiful yellow colour, whilst the lower portion of the mixture was coloured red. When water was added and the mixture shaken, the liquid separated into two layers, of which the lower acid aqueous layer was rose-coloured, and the uppermost ethereal layer took a greenish blue tint, and had a strong red fluorescence.

Hydrochloric acid induced a rose colour rather slowly. Upon the addition of ether this became faintly green. When water was added the underneath layer was rose-coloured, but the ether retained its green colour. In some experiments a blue colour was produced.

Nitric acid caused first a rose coloration, then red, soon becoming greenish. Upon adding ether and water, and shaking, the underneath layer was rose, and the ether rising to the top took a violet-blue grey colour.

The blue and green tints were rapidly altered by the action of air and light.

These observations were made upon pure and quite colourless oil of peppermint. When the yellow or greenish yellow tinted oils frequently met with in commerce were employed, the phenomena of coloration were much more intense with sulphuric and hydrochloric acids; whilst with nitric acid the ethereal layer acquired a magnificent green colour and a strong red fluorescence. The rose coloration first produced by the acids had a violet reflection. Moreover, when chloroform was employed in the place of ether, sometimes a violet or a grey colour was obtained, the latter being the result of a mixture of yellow and violet, or perhaps red and green, or even blue and orange.

From the foregoing, the author concludes that the coloration produced by picric acid when reacting upon the oil of peppermint is not a property peculiar to itself, but common to the strong acids; that the picrate of the hydrocarbide which he sought was not produced; that it was not a case of oxidation *pur et simple* as might have been supposed with picric acid. He looks upon the coloration as a phenomenon dependent upon the separation and combination of the colouring matters contained in the oil of peppermint. He thinks that the acids spilt up the oil into five colouring principles, red, blue, green, yellow, and violet; and that, according to the quantity and nature of the acid employed, one or other of these principles is obtained, or perhaps a grey resulting from a mixture of two complementary colours.

Relation of the Green Colouring Matter to Chlorophyll.—The author remarks upon the striking analogy which appears to exist between the green substance obtained by the action of acids upon oil of peppermint and chlorophyll, which is set forth in the following table:—

<i>Chlorophyll.</i>	<i>Green Matter obtained by the Action of Acids on Oil of Peppermint.</i>
Strong red fluorescence.	Strong red fluorescence.
Becomes reddish yellow in the air (dead leaves).	Exposed to the air, it is changed into a reddish yellow substance.
Treated with alkalies it becomes yellow.	Treated by alkalies, it becomes yellow.
Reduced and decolourized by nascent hydrogen.	Reduced and transformed into a brown matter by nascent hydrogen.
Yellow leaves become green by the action of acids.	After being made yellow by alkalies, again becomes green when treated with acids.
The green and blue colours obtained by the action of acids on chlorophyll are decomposed by light.	The green and blue colours obtained by the action of acids upon oil of peppermint are decomposed by light.

This comparative table presents points of great resemblance, of which the most important doubtless is the fluorescence, the red fluorescence being characteristic, and confined to these two substances. Supposing it probable that in both cases the appearance is due to chlorophyll, the author endeavours to explain its formation in the oil of peppermint. He considers that as his experiments were made with colourless oil of peppermint, it is necessary to assume that the constituent elements of chlorophyll exist in that essence; but that probably they exist there in a state of reduction, and that it is only under the influence of acids that a kind of synthesis of the chromule takes place. The blue principle (Frémy's phyllocyanine) and the yellow principle (phylloxanthine) are, so to speak, in a latent and colourless state, either in consequence of reduction, or their combination with the other colouring principles present in the oil. Under the influence of acids the phyllocyanine is regenerated, and at the same time the phylloxanthine, separated from the red and violet principles, unites with the blue especially to form the green colour. With picric acid and nitric acid the green coloration is more intense than with the other acids, because an oxidizing action is combined with a separative action.

According to this hypothesis, which the author proposes to test by further experiment, chlorophyll, or at least its constituents, are volatilizable in the state in which it actually exists in oil of peppermint. The greenish colour which is seen in the oil when imperfectly rectified would then be due probably to chlorophyll, of which the elements have not been completely altered in a first distillation.

Action of Chloral upon Oil of Peppermint.—The rose coloration which takes place when hydrate of chloral is shaken with oil of peppermint, which was pointed out by M. Carl Jehn, has also been the subject of experiment by the author. He has come to the conclusion that the colour is produced in the oil of peppermint, and not in the chloral hydrate, and that it only occurs when the chloral hydrate used is acid, it being more intense in proportion as the chloral hydrate is more acid. But he has not yet been able to experiment with perfectly neutral specimens. In this case the reaction would be due to the formic acid contained in the chloral hydrate, or possibly to hydrochloric acid resulting from partial decomposition.

Action of Water upon Lead. M. Fordos. (*Journ. de Pharm. et de Chim.*, xix., 20.) In the course of his experiments on the applicability of lead for waterpipes and cisterns, the author could not detect a trace of lead in ten litres of river water taken

from the leaden cistern of one of the Paris hospitals. But upon shaking pure water with shot and air, a coating of carbonate of lead was formed on the sides of the bottle, which almost rendered the glass opaque. On dissolving the film in HNO_3 , and estimating the lead, it was found that one litre of water had produced five milligrams of the carbonate. Wine and vinegar would also dissolve that film; and as shot is commonly used for cleaning wine bottles, lead frequently finds its way into wines, a fact which may account for many of the cases of chronic poisoning by lead which occur in large towns. The detection of small traces of lead in forensic investigation would therefore afford no proof of any intentional poisoning. Orfila's erroneous statement that lead is a normal constituent of the human organism may also be accounted for in this way.

It is well known that hard waters do not act upon lead to such an extent as the pure water used in the above experiment, as they form an insoluble incrustation of a double carbonate of lead and calcium on the surface of the lead, which thus becomes protected against the further action of the water.

Iodide of Bismuth and Potassium as a Test for Alkaloids. M. Yvon. (*Pharm. Journ.*, 3rd series, iv., 1014; from *Répertoire de Pharm.*, ii., 335.) The employment of the double iodide of bismuth and potassium has been indicated for the detection of alkaloids, but the value of this new reagent has not yet been sufficiently established. The author, in a note read recently before the *Société d'Emulation pour les Sciences Pharmaceutiques*, describes a method for its ready preparation.

The preparation of the reagent by means of iodide of bismuth, obtained according to either of the processes given in Wurtz's Dictionary, and iodide of potassium, appears to present some difficulties, the iodide of bismuth not being entirely soluble in the alkaline iodide. But it is not at all necessary to use the iodide of bismuth, and the author gives the details of several alternative processes, but for various reasons adopts the following as the most convenient:—

R	Subnitrate of Bismuth	.	.	.	1.50 grams.
	Iodide of Potassium	.	.	.	7.00 grams.
	Hydrochloric Acid	.	.	.	20 drops.
	Water	.	.	.	20 grams.

The subnitrate is suspended in water and boiled, and the alkaline iodide and the acid are then added. A limpid solution is thus ob-

tained of a very fine orange-yellow colour, which may be readily used as a test for alkaloids.

If one drop of this solution be poured into water, a white precipitate is produced, resulting from the decomposition of the salt by the water. This decomposition may be avoided by the addition of a few drops of an acid, the author preferring hydrochloric acid for the purpose. It is not indifferent whether the acid be added to the reagent or to the solution to be tested for an alkaloid; four drops of hydrochloric added to 40 or 50 c.c. of the latter being sufficient to prevent the decomposition, but a much larger quantity is required if added to the iodide reagent.

If the solution be not sufficiently acid, the decomposition takes place after some minutes, instead of occurring immediately. But the more or less deep orange-yellow precipitate resulting from the presence of an alkaloid may be confounded with the pale yellow product of the decomposition of the iodide by water.

Prepared in the above manner, this reagent deposits after some time a blackish powder which is easily recognized as iodide of bismuth, and may be removed by filtration.

The alkaloid precipitate does not appear to present a constant composition, it seeming to vary according to the proportion of acid present in the solution. Thus, for example, in precipitating quinia from a solution of its sulphate, if only sufficient acid be added to prevent the decomposition, a beautiful orange-red precipitate is obtained; but if there be an excess of acid, the precipitate is paler and diminished in volume.

Since, therefore, the nature of the precipitate varies, and the composition of the reagent itself also changes, M. Yvon considers it would be impossible to use the double iodide of bismuth and potassium as a volumetric test; but it would be useful for the detection of alkaloids where the precautions indicated are taken.

A New Test for Free Ammonia. J. Moddermann. (*Wittstein's Vierteljahresschrift*, xxii., 573.) Pure sulphate of copper when treated with a moderate quantity of distilled water forms a clear solution which is rendered turbid by the addition of a larger quantity of the solvent, and deposits a slight pale green precipitate of basic sulphate of copper. The author attributes this change to the presence of traces of free ammonia in the distilled water, for the detection of which he therefore recommends a solution of sulphate of copper as a test. The extreme delicacy of this test is still further increased by the application of a gentle heat.

The turbidity produced by the addition of a large quantity of

distilled water to a neutral solution of ferric chloride appears to be also due to the action of ammonia.

The Assumed Formation of Ozone by the Oxidation of Essential Oils. C. T. Kingzett. (Abstract of a paper read before the Chemical Society, *Journ. Chem. Soc.*, 2nd series, xii, 511; *Pharm. Journ.*, Aug. 1st, 1874.)

It is generally stated in books that the oxidation of oil of turpentine is attended with the production of ozone. Thus in vol. iii. of "*Miller's Chemistry*" it is stated: "Oil of turpentine gradually absorbs oxygen from the air with the formation of a certain proportion of ozone;" and in Gmelin's work (vol. xiv.) it is written: "Oil of turpentine absorbs oxygen gas, acquiring new properties, and being converted into ozonized oil of turpentine.

Further, Lawes, Gilbert, and Pugh, have stated their belief that the supposed ozone existing in the vicinity of vegetation is due to the oxidation of hydrocarbons evolved by plants. (*Chem. Soc. Journ.*, 2nd series, i., 1863, 100.)

These statements, variously modified, have been so often repeated, that at last they are almost universally received as matters of facts. But although a vast amount of work has been done on this subject, especially by Schönbein, whose peculiar views on the matter are so well known, yet it cannot be said that the information is absolute. On the other hand, there has ever existed more or less doubt about the formation of ozone by the oxidation of such bodies as oil of turpentine.

It was with the view of acquiring more certain knowledge that the author made a series of experiments, the results of which are recorded in a paper recently read before the Chemical Society.

In commencing his experiments he first of all wished to get some definite notion as to the rate of absorption of oxygen by such bodies as oil of turpentine. For this purpose the liquid to be experimented upon was enclosed in a graduated tube containing air or oxygen, and the volume of the gas read from time to time. It was thus seen that ether, potassium-naphtha, oil of turpentine, and such bodies rapidly absorb oxygen from air or oxygen gas.

A few cubic centimetres of naphtha absorbed 25 c.c. of oxygen in 36 days, *i.e.*, the whole of the oxygen present. In yet another experiment with air, the turpentine oil (not in sunlight) absorbed 10.5 c.c. of gas during 14 days, that being the theoretical amount of oxygen in the air used.

Benzin showed no absorption of oxygen during 40 days. After this, similar experiments were made with the oils of bergamot,

chamomile, caraway, cloves, juniper, lemon, thyme, copaiba, cubebs, etc., etc.

The numbers given in the following table are not valuable as showing the absolute relative absorption of oxygen by the various substances, as some were conducted in sunshine whilst others were not.

Body Used.	c.c. Oxygen Absorbed.	No. of Days.	=Daily.
			c.c.
Oil of Caraway	18 (from Oxygen) .	6	3
„ Bergamot	12 „	4	3
„ Juniper	5 „	2	2.5
„ Cubebs	4 „	2	2
„ Lemon	16 „	13	1.2
Naphtha	25 „	33	.7
Oil of Turpentine in Sunshine (a)	220 „	6	36.6
„ „ Shade (b) .	20 „	36	.6
„ „ „ (c) .	10 (from Air) .	14	.75
„ Chamomile	6 (from Oxygen) .	11	.55
Ether (absolute) (a)	6.5 „	34	.19
Ether (absolute) (b)	6.5 (from Air). .	34	.19

These bodies, which had thus absorbed known amounts of oxygen, were agitated after the experiment with a mixed solution of potassium iodide and starch, when they invariably developed the well-known blue coloration more or less quickly. It is remarkable that this coloration does not take place immediately, as one might suppose would be the case if these bodies contained dissolved ozone.

On the other hand, in the case of the bergamot above given, where 12 c.c. of oxygen had been absorbed, there was absolutely no coloration with the potassium iodide and starch for some minutes, but it then gradually became of an opaque blue. The same remark applies to the other cases for the most part.

Evidently, therefore, an agent now existed in these oxidized oils, having properties like those possessed by ozone.

This fact was confirmed by taking the various bodies and placing them in tubes, together with a solution of potassium iodide, covering the mouths of the tubes with paper, and exposing to diffused daylight. Ether, naphtha, and turpentine and caraway oils gave almost immediately a yellow line between the two layers, showing either that they precontained the active agent, or quickly produced it. Time was required in all the other cases, in all of which affirmative results were obtained and rendered very evident

by the addition of a solution of starch. Confirmation of these results was further obtained by placing the substances in tubes heated to 70° C. by means of a steam-bath, and spreading over the mouth of the tubes paper soaked in the potassic iodide starch mixture. But the best results were obtained by mixing in watch-glasses the substance to be tried and the test-solution.

As the oils of turpentine and caraway were found to give the most decided reactions, most of the subsequent experiments were confined to them. These experiments, which are recorded at length in the original paper, led the author to the conclusion that the active agent produced in the oxidation of these oils, although possessing properties similar in many respects to ozone, is not ozone or peroxide of hydrogen, but an oxidized principle derived from terpene ($C_{10}H_{16}$), namely, a monohydrated oxide of turpentine ($C_{10}H_{16}O \cdot H_2O$). The evidence upon which this conclusion is based is thus summarized:—

When oil of turpentine is exposed to air or oxygen, in presence of moisture, it oxidizes, producing an agent which resembles ozone and peroxide of hydrogen, inasmuch as it gives a similar reaction with potassium iodide. It further resembles peroxide of hydrogen, because it gives a violet coloration with chromic acid solution acidulated with sulphuric acid. It cannot, however, be peroxide of hydrogen, because, although it is somewhat soluble in water, the solution retains its properties after long continued boiling. It again resembles the aforementioned bodies by being totally destroyed by peroxide of manganese, but it also differs from them by having much more stable properties, resisting, to a certain extent, the action of sodium hyposulphite, and temperatures considerably above the boiling point of water. Although destroyed by peroxide of manganese and other agents, the body again forms on exposure to air and moisture.

Lastly, the active agent so like to ozone is destroyed at the boiling point of oil of turpentine, viz., 160° , and temperatures at which ozone and peroxide of hydrogen are not destroyed, when chloride of zinc is present. It is also destroyed by other dehydrating agents and by certain deoxidizing agents.

It is increased in amount by heating to 100° in presence of water, but in the oil which distils over at that temperature there is none of it. Simple exposure to air is, however, alone necessary for its formation in this distilled portion, which then has the same properties as the parent oil.

Oil of turpentine is generally credited with the power of ozonizing

the air in its vicinity, as well as with the power of dissolving a certain amount of the ozone to which its oxidation is supposed to give rise. This is because it has long been known that potassic iodide test-paper exposed to its vapour speedily indicates the well-known reaction of ozone; but this must now be explained by the oil evaporating and oxidizing to this peculiar product, for the oil which has been subjected to the action of peroxide of manganese or chloride of zinc, or any of the other means which have been pointed out as efficient in destroying the active principle, no longer has the power of so influencing the air in its vicinity, until it has been allowed to stand in contact with air (and moisture?) for some time.

By experiments now in hand, the author hopes to be able to adduce more conclusive evidence as to the composition and constitution of the oxidized product of oil of turpentine, which possesses such interesting properties; also to show more precisely the circumstances under which it is produced, and to build it up synthetically from terpene or cymene, etc. For the present he can only hint at its nature. His notion, as has already been stated, is that it is $C_{10}H_{16}O.H_2O$.

1. By the loss of H_2O_2 this becomes $C_{10}H_{16}$. Sulphuric acid causes by its action upon the oxidized oil the formation of a body which gives a violet coloration to chromic acid solution.

2. By the loss of $2H_2O$, the body becomes $C_{10}H_{14}$. Chloride of zinc destroys the active agent, and $C_{10}H_{14}$ (cymene) is a product of its reaction upon $C_{10}H_{16}O$.

3. By the loss of O it becomes $C_{10}H_{16}H_2O$. Deoxidizing bodies, as pyrogallate of potash, etc., also destroy the active agent. These data combine to show that the constitution of the body is as represented. It is also a fact that $C_{10}H_{16}O.H_2O$ is somewhat soluble in water.

The Chemistry of Milk. By Edward J. Hallcock. (*Journ. of App. Chem.*, June, 1874.) Like most other articles of food, milk consists largely of water, nearly 88 per cent. being present in pure and unadulterated country milk. Professor Wanklyn gives the following as the average composition of country milk:—

Water	87.56 per cent.
Fat	3.07 per cent.
Casein	4.04 per cent.
Milk-sugar	4.62 per cent.
Ash	.71 per cent.

100.00

The fat, which exists in the form of minute globules, is a mixture of olein, palmitin, stearin, butyrin, and other fats. When the little sacs containing this fat are broken by agitation, as in the operation of churning, the fats agglomerate together to form butter. The specific gravity of milk fat is about 0.9, while the solution in which it is suspended will average about 1.03, so that when milk is left at rest for two or three hours it rises to the top and forms what is known as cream. In the manufacture of butter, this alone is employed, as it contains all the fat, along with the peculiar flavouring matter of the butter. According to Chevreul, ordinary butter from cows' milk is composed of stearin, margarin, and olein, with small quantities of butyrin, caproin, and caprin, to which its odour is due. In fresh butter, the butyric acid ($C_4H_8O_2$) is combined with glycerin to form butyrin, an inodorous substance. On standing, the butyric acid is set free, and imparts to rancid butter its well-known and unpleasant odour. Butyric acid, although not very pure, can be obtained by saponifying butter with an alkali, and distilling the soap with sulphuric acid. It is employed in the manufacture of butyric ether, or oil of pineapple. Good milk usually contains about 10 per cent. of cream, and some idea of the purity and richness of the milk may be gained by pouring some of it into a graduated glass tube, and noticing the number of spaces occupied by the cream after it is allowed sufficient time to settle. Tubes intended for this purpose are sold under the name of creamometers.

Casein is the name applied to the nitrogenous constituents of milk, which are coagulated by acids, and which have received this name from their use in the manufacture of cheese. A portion of the nitrogenous substance, known as albumen, is coagulated by boiling, and then forms those repulsive little films generally met with in boiled milk. Casein is soluble in fresh milk, but insoluble in milk which has "turned." Wanklyn attributes this to a molecular change, resembling the change from soluble silica to insoluble silica. This change, as we have said above, is produced by the presence of any acid; in "sour milk" it is caused by the lactic acid ($C_3H_6O_3$) formed by the incipient decomposition of the milk-sugar. In the manufacture of cheese, the milk is curdled by means of rennet; but before doing this, more or less of the cream is removed, rendering the cheese less nutritious than the milk from which it was formed. A skim-milk cheese contains but 6 per cent. of fat, while some rich English cheeses contain 30 per cent. The ultimate composition of casein is the same as albumen and fibrin. Milk from which both fat and casein have been removed as far as practicable is

known as whey, and is essentially a solution of milk-sugar with some mineral salts. Milk-sugar can be prepared by coagulating the casein, and removing that along with the fat, and then evaporating the whey to crystallization and purifying by filtration through animal charcoal. It is manufactured principally in Switzerland, and comes into market crystallized on strings, when it somewhat resembles an ear of corn. It has the composition $C_{12}H_{24}O_{12}$, dried at $212^{\circ}F$. It is much less soluble than cane-sugar, dissolving in 5 or 6 parts of cold water, and $2\frac{1}{2}$ parts of boiling water. It is not so heavy as cane-sugar, and reduces the oxide of copper like grape-sugar. Its principal use is in the preparation of homœopathic medicines, as envelope and dilutant.

The ash, or mineral matter, which remains when milk is dried up and the residue incinerated, consists mainly of phosphate of lime and alkaline chlorides. The quantity of mineral matter in cows' milk is but three-fourths of one per cent.; in human milk it is much less, or about one seventh of one per cent.

Testing Milk.—Since it has become customary for milk dealers to endeavour to palm off on their customers a minimum quantity of real milk, mixed with a maximum quantity of water, under the name of milk, it is sometimes interesting to compare different samples of such milk for the purpose of determining the amount of water added. English chemists have devoted considerable attention to this subject, because there a law exists punishing adulterations in food and medicine, and we shall frequently have occasion to refer to their observations. The specific gravity of milk, as indicated by hydrometers made for the purpose, does not serve to detect carefully conducted watering. The average density of good pure milk, is about 1.032. Since milk fat is lighter than water, the more cream the milk contains the lower its specific gravity, while skimmed milk has a higher specific gravity than unskimmed milk. Hence it is possible to preserve the normal density in watered milk by first removing a portion or all of the cream, and then adding just enough water to bring it back to its original density. To ascertain the quantity of water added, it is necessary to determine by analysis the quantity of fat present in the milk. John Horsley, F.C.S., accomplishes this in the following manner:—A glass tube, 11 inches long, and three-fourths of an inch in diameter, is graduated from 10 inches down, one-fifth of its length, into per cent., or hundredths. A tablespoonful, 15 c.c., or 250 grs. of milk are first poured into the glass tube; a similar bulk of ether is next poured in, and the tube closed with the thumb or a cork, and agitated for

four or five minutes. An equal measure of alcohol is next added, and the whole well shaken for at least five minutes more, when, on placing it in an upright position on a stand, the oily or fatty matter will rise to the surface, and can be easily read off. Each line will correspond to 4.15 grains of solid butter, as proved by experiment. Milk which has 10 per cent. of cream will show two lines of butter oil, or 8.3 grains, for 250 grains of milk. If desired, the butter may be drawn off and weighed in a small platinum capsule.

Mr. Wanklyn prefers to evaporate 5 c.c. of the milk to dryness in a weighed platinum dish over a water-bath. The operation requires at least three hours. The residue equals the total milk solids, and averages, with a sample of good country milk, 12.45 per cent. This residue is treated with ether and heated to boiling, and the solution poured through a small filter, the operation of boiling and pouring off the ethereal solution being repeated three times. The solution of fat is placed in a larger weighed dish, and the ether gently evaporated by placing it in warm water. When toward the close, it becomes turbid, the dish is placed on a water-bath, and heated to 100° C. for a short time, until the fat is dry, when it is weighed. The weight of the fat, subtracted from that of the total milk solids, gives the amount of milk solids not fat, a very important datum, as it is the most constant quantity in milk analysis, and gives, by a very simple calculation, the extent of watering to which the milk has been subjected.

The determination of casein is usually unnecessary, but may be made to prove that the milk was adulterated with skim instead of water. The portion insoluble in ether is extracted with strong alcohol, then with boiling water, dried up in a water-bath, weighed, ignited, the ash weighed, and its weight subtracted from the previous weight of casein and ash. The result is crude casein, including, of course, the albumen, etc. The use of skimmed milk is shown by the presence of more casein than the natural quantity, and less butter or fat.

The determination of the total ash is made by simply evaporating 5 c.c. of milk to dryness and igniting over a spirit lamp or Bunsen burner. If less ash is found than usual, it indicates watering; if more than usual, chalk or other mineral adulterant has been employed.

Soluble Starch. *M. Musculus.* (Abstract of a paper read before the French Academy. . *Comptes Rendus*, lxxviii., 1413; *Pharm. Journ.*, July 4th, 1874.) Chemists are not in accord as to what is to be understood by "soluble starch." Some consider

as such the matter coloured blue by iodine, which can be removed from starch by means of water, and which Naegeli has called "granulose." Others think that the substance coloured violet by iodine, which Béchamp obtained by treating starch with sulphuric acid, to be the true soluble starch. But the author has found that granulose, although it passes readily through a filter, is not really soluble in water, for it can be separated by evaporation in a state completely insoluble even in boiling water. Also that the soluble starch of Béchamp is a mixture in which may be found granulose, soluble starch, and the products of decomposition of starch (dextrin, glucose, or glucosin), which are always formed with sulphuric acid.

The author has previously made known, under the name of "*dextrine globulisée*," a body insoluble in cold water, which he obtained by dissolving starch in boiling acidulated water, and evaporating after saturation of the acid and filtration, to the consistence of a syrup. This deposits an abundance of granules, insoluble in cold water and soluble only at 50° C., a property that allows of their being washed and separated from the dextrin of glucose by which they are accompanied; further treatment with alcohol will remove a little granulose still adhering, and there will then be left what the author considers to be true soluble starch; the granules composing it being grains of starch deprived of their organization.

The author enumerates the following properties of this product to substantiate his assertion. When dried in the air it is white, and resembles starch. Freshly washed, it is insoluble in cold water, and does not reduce salts of copper; but if it be left for some time in contact with water, it dissolves perceptibly, and there is at the same time a little sugar formed. Its rotatory power is nearly quadruple that of dehydrated glucose. It dissolves entirely in water at 50° C., and is not precipitated upon cooling; by evaporation, however, a residue is obtained which has recovered its insolubility in cold water. To redissolve it, it is necessary to heat it to boiling, or allow it to digest for half an hour in a water-bath at 100° C. Alcohol precipitates it, and also restores it to its insoluble state. The same result is obtained by congealing the solution in a freezing mixture, it being found when the ice is melted as a white precipitate at the bottom of the vessel. When this substance is mixed with dextrin and glucose, as in the mother-liquor wherein these granules are formed, all these properties disappear.

These artificial starch granules give with iodine all the colour reactions obtained with the natural granules as well as those given

by dextrin, according to the disposition of their molecules, the result being variable at will. Thus, a dilute solution takes a pure red colour; but when it is concentrated to saturation, iodine gives rise to a violet colour. If iodine be added to a solution moderately diluted, so as to produce a deep red-brown colour, and the solution be allowed to evaporate in the open air, it will gradually grow more and more purple; and eventually, when sufficiently concentrated, become of a magnificent pure blue colour. If water be added, the violet colour reappears, and in its turn gives place to a pure red.

If, instead of concentrating the red liquid by evaporation, a neutral salt having an affinity for water, such as chloride of calcium, be added, the result is the same. If the blue solution be allowed to stand for twenty-four hours, it deposits a blue-black substance, which is not dissolved by cold water. This precipitate, however, appears to dissolve in water; it does not affect its transparency, and passes readily through a filter, but after a very short time it is again deposited. This is characteristic also of the iodized granulose; from which the author concludes that in both bodies the disposition of the molecules is the same, and that they do not differ in degree of cohesion.

The iodized artificial granulose can, in fact, be destroyed, by a slight elevation of temperature; it enters into solution in the water in which it was suspended, and is then only coloured red with iodine, whilst natural granulose resists a boiling temperature, and continues to be coloured blue with iodine. The artificial granules resemble also natural grains of starch, in not being coloured by a small quantity of iodine, the blue only appearing when it is in excess; but if they be triturated in a mortar with a small quantity of iodine, a mass of a pure blue colour is produced.

When starch is incompletely dissolved, either with diastase or boiling acetic acid, the fragments which resist the longest are no longer coloured blue with iodine, but take a tint which varies from yellow to orange-red. The artificial granules give the same colours if their cohesion be augmented, which may be done by dissolving in water and evaporating to dryness.

Diastase decomposes soluble starch in the same manner as natural starch, but much more easily and completely. According to the observations of Payen, Schwarzer, Schulze, and the author, when diastase is caused to act upon starch, all coloration with iodine disappears when the degree of saccharification reaches one fourth; then, by augmenting the diastase, the saccharification may be increased to one half, a point that is not passed to any sensible extent;

in fact, by his earlier experiments, the author was led to think that it was not possible to saccharify more than one-third of a given quantity of starch by means of diastase. With soluble starch, however, the stoppage of the saccharification at one-third does not occur. The reaction with iodine disappears when it reaches one-fourth; then, if more diastase be added, the production of sugar goes on rapidly until it reaches one-half, when it ceases, as with natural starch.

A widely diffused opinion, introduced into science by Naegeli, regards starch as essentially composed of cellulose mixed with a little granulose. Béchamp has found that dextrin obtained from cellulose has less rotatory power than dextrin from starch. The author prepared dextrin from cellulose by dissolving cotton in strong sulphuric acid. This dextrin was afterwards saccharified with boiling acidulated water, and it was found that during this transformation the rotatory power was not changed. Starch, treated in the same manner, yielded, on the contrary, a dextrin of which the rotatory power had been lowered more than one-half by the saccharification. It follows that the dextrin from cellulose has the same rotatory power as the sugar which is derived from it, which is not the case with that from starch. The author further remarks that all the dextrins of starch-sugar have a rotatory power at least double that of the sugar itself.

It is known that glucose freshly dissolved, and especially dehydrated glucose, has a rotatory power at least double that of glucose that has been some time dissolved in a small quantity of water; but this property is not persistent. The author has prepared a dextrin from glucose, by treating that sugar with concentrated sulphuric acid and then with alcohol of 95 per cent. This anhydride has also a rotatory power double that of the glucose, and this power is persistent.

The author has not yet obtained sugar from cellulose sufficiently pure to be able to compare it with sugar from starch; but he feels certain that there is no great difference between their rotatory powers; so that their isomerism would not be manifested so clearly as in their dextrins.

The author proposes to investigate whether other sugars which are regarded as identical with glucose,—the glucoses of honey and of fruits, diabetic sugar, etc.,—present the same kind of isomerism.

Note on the Solubility of Chloride of Lead in Glycerin. Charles H. Piesse. (*Journ. Chem. Soc.*, June, 1874.) The author has made a number of quantitative experiments to ascertain the solubility

of plumbic chloride in glycerin, and in mixtures of glycerin and water.

Pure glycerin of commerce was dried in a water-bath, until it ceased to lose weight; about 100 c.c. of it was then rapidly poured into a dry bottle capable of holding about 150 c.c., and some dry Pb Cl_2 in impalpable powder added; the bottle then corked, and hermetically sealed, was agitated for a couple of days, being placed in the water-bath during the intervals, so as to maintain the temperature at about 100°C . The glycerin was then filtered in the water-bath, the funnel having been previously heated therein, the filtrate being collected in a weighed dish. When a quantity equal to about 300 grains had filtered, the dish was removed, allowed to cool in a desiccator, and then rapidly weighed, a precaution which the very hygroscopic character of glycerin renders imperative. The weighed filtrate having been washed into a beaker, some dilute sulphuric acid was added, the precipitated plumbic sulphate being collected and weighed with the usual precautions. The following were the results of two determinations:—

	Used.		Pb SO_4 found.		Solubility of Pb Cl_2 in 100 of $\text{C}_3 \text{H}_8 \text{O}_3$.		Average.
I.	274.59	.	6.07	.	2.01	.	} 1.995
II.	385.85	.	8.18	.	1.97	.	

The solubility of the plumbic chloride appears not to be perceptibly increased by the temperature at which the experiments were performed, since after several days standing in the cold (always in a desiccator), only the slightest possible opalescence was noticeable; the advantages gained by heating being the diminished viscosity of the glycerin, and the prevention of the absorption of moisture.

For the second, weighed quantities of dry glycerin were mixed with weighed quantities of distilled water in specific proportions. The bottles containing the mixtures, with an excess of plumbic chloride, were intermittently shaken for about a week; these experiments being conducted at the ordinary temperature. The results show that the solubility of the plumbic chloride is in direct ratio to the proportions of the glycerin and water. Thus:—

Mixture A. $\text{C}_3 \text{H}_8 \text{O}_3$, 50 per cent. + $\text{H}_2 \text{O}$, 50 per cent.

	Used.		Pb SO_4 found.		Solubility per cent.		
I.	371.60	.	5.55	.	1.37	.	Theory, 1.363.
II.	389.48	,	5.35	.	1.26	.	Practice average, 1.32.

Mixture B. $C_3 H_8 O_3$, 25 per cent. + $H_2 O$, 75 per cent.

Used.	Pb SO_4 found.	Solubility per cent.	
I. 307.88 . .	3.39 . .	1.01 . .	Theory, 1.044.
II. 418.43 . .	4.87 . .	1.06 . .	Practice average, 1.036.

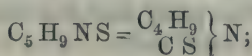
Mixture C. $C_3 H_8 O_3$, 12.5 per cent. + $H_2 O$, 87.5 per cent.

Used.	Pb SO_4 found.	Solubility per cent.	
453.39 . .	4.43 . .	0.91 . .	{ Theory, 0.889. Practice, 0.91.

In calculating the solubility of plumbic chloride in these mixtures, the author has taken its solubility in pure water to be 0.733 per cent. By adding together the weight of the plumbic chloride dissolved by the quantity of glycerin present in 100 parts of the mixture (as determined from the experiments with pure glycerin), and that dissolved by the water, he obtained the theoretical amount which the mixture was capable of dissolving. These approximate so closely to practical results, that they seem to prove the accuracy of the determinations of the solubility in pure glycerin. In order to see that the whole of the lead was precipitated from these mixtures by sulphuric acid, the filtrates from them were neutralized with ammonia, and then treated with sulphuretted hydrogen, without causing more than the slightest discoloration.

The Synthesis of the Oil of Cochlearia Officinalis. By A. W. Hofmann. (*Ber. der deut. chem. Ges.*, 1874, 508.) The researches of J. E. Simon on the essential oil of *Cochlearia officinalis* (*Pogg. Ann.*, l., 377), show that there is a great similarity, in a chemical point of view, between this oil and oil of mustard, though the boiling points of the two oils differ considerably. O. Geiseler, who seventeen years later investigated the same subject, came to the conclusion that the oil of cochlearia contains oxygen but no nitrogen, and that it would probably be an oxysulphide of allyl. This view, however, was fully disproved by the author of the present essay, who showed that this oil contains no less than 12 per cent. of nitrogen, and that its behaviour to ammonia and the amines, as well as to sulphuric acid and to desulphurating agents, stamps it as an unmistakable mustard oil.

From about 50 kilograms of the fresh herb he obtained about 11 grams of an oil boiling between 158° and 165° ; and this, upon repeated rectifications, yielded a fraction having a constant boiling point of 161° – 163° . The analyses of this fraction led to the formula



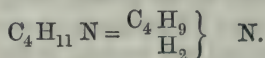
according to which this oil appears to be a mustard oil of the butyl series.

<i>Calculated.</i>			<i>Found.</i>			
			I.	II.	III.	IV.
C ₅	60	52.17	53.06	52.77	52.79	—
H ₉	9	7.83	7.90	7.86	7.95	—
N	14	12.17	—	—	—	11.93
S	32	27.83	—	—	—	—
	—	—	—	—	—	—
	115	100.00				

The oil when kept in contact with solution of ammonia for several days, forms a complete solution, from which an ammonia compound crystallizes in fine white needles, which fuse at 134°, and are soluble in alcohol and ether. The composition of this sulphur urea is represented by the formula C₅ H₁₂ N₂ S = C₅ H₉ NS, H₃ N.

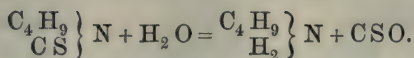
<i>Calculated.</i>			<i>Found.</i>				
			I.	II.	III.	IV.	V.
C ₅	60	45.45	45.10	45.44	—	—	—
H ₁₂	12	9.09	8.95	9.28	—	—	—
N ₂	28	21.22	—	—	21.74	—	—
S	32	24.24	—	—	—	24.10	24.09
	—	—	—	—	—	—	—
	132	100.00					

In order to remove the least doubt as to the composition of these substances, the author prepared and examined the amine, corresponding to the oil of cochlearia. For this purpose he heated the crude oil with H₂ S O₄. An energetic reaction ensued, causing the evolution of sulphocarbonic oxide and sulphur dioxide, and a copious separation of carbon. An amine sulphate was formed, which, by treatment with K H O, and prolonged contact with sodium wire, yielded the base as a colourless, transparent, very limpid liquid, boiling at 63°, and having the composition of butylamine:—



<i>Calculated.</i>			<i>Found.</i>
C ₄	48	65.75	65.28
H ₁₁	11	15.07	15.24
N	14	19.18	—
	—	—	—
	73	100.00	

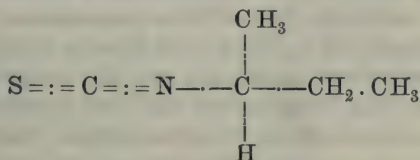
Thus affording a further proof that the substances experimented on really belong to the butyl series.



This butylamine, when treated with CS_2 and HgCl_2 , again yielded a mustard oil, whose sulphocarbamide had the same melting point as that of the oil of scurvy-grass.

It still remained to be decided from which of the four isomeric butylic alcohols, the oil of scurvy-grass is derived. Experimenting first with isobutylic alcohol (isobutylcarbinol), the author found that its amine boils at 65.5° ; that its mustard oil has a specific gravity of $.9638$ at 14° , and that its sulphocarbamide fuses at 93.5° ; and these figures convinced him that the oil is not a derivative of this alcohol. He next satisfied himself that it is not derived from the normal butylic alcohol, as the mustard oil obtained from the latter (normal butyl mustard oil) boiled at 167° , and yielded with ammonia a slowly crystallizing sulphocarbamide fusing at 79° .

The synthesis of the oil of scurvy-grass was ultimately brought to a successful issue by selecting the secondary butylic alcohol (methyl-ethyl-carbinol) as the starting point of the experiments. The iodide of this alcohol was prepared and converted by ammonia into the amine, from which the corresponding mustard oil was obtained by means of CS_2 , etc. This secondary butyl mustard oil was found to be a colourless transparent liquid of $.944$ spec. gr. at 12° , boiling at 159.5° , and having the characteristic odour of oil of scurvy-grass. The crystallized sulphocarbamide, obtained from this mustard oil by ammonia, fuses at 133° , so that its melting point is but one degree below that of the sulphocarbamide prepared from the natural oil. Thus there can be no doubt that the essential oil of *Cochlearia officinalis* is the isosulphocyanate of the secondary butylic alcohol. Its structure is represented by the following formula:—



The Composition of the Essential Oil of Tropaölum Majus. By A. W. Hofmann. (*Ber. der deut. chem. Ges.*, 1874, 518.) The author found that this oil begins to boil at 160° , and that the first portions of the distillate contain sulphur and have a most disagreeable odour. The largest portion, distilling at 226° , has the formula $\text{C}_8\text{H}_7\text{N}$, and is the nitrile of a toluic acid.

Calculated.			Found.
C ₈	96	82.03	81.60
H ₇	7	5.98	6.19
N	14	11.99	—
	117	100.00	

A further investigation showed that this compound is identical with the nitrile of phenylacetic acid obtained by Cannizzaro (*Ann. Chem. Pharm.*, xcvi., 246), by boiling benzyl chloride with an alcoholic solution of K H O.

The Composition of the Essential Oil of *Nasturtium Officinale*.
A. W. Hofmann. (*Ber. der deut. chem. Ges.*, 1874, 520.) The oil of *Nasturtium* is a mixture the boiling point of which varies during distillation from 120° to 280° C. The main fraction is obtained at 261°, and has a specific gravity of 1.0014 at 18°; its composition is represented by the formula C₉ H₉ N.

Calculated.			Found.
C ₉	108	82.44	82.11
H ₉	9	6.87	7.13
N	14	10.69	—
	131	100.00	

From which it appears to be homologous to the oil of *Tropaölum*. The author's further researches show that this oil is mainly the nitrile of phenylpropionic acid.

Tartrates and Citrates of Iron and their Ammonium Compounds.

C. Méhu. (*Journ. de Pharm. et de Chim.*, 4th series, xviii., 85.) The extensive medicinal use of ferrous salts has induced the author to publish the results of his experiments made with the object of preparing ferrous tartrate and citrate, and ferric and ammonic tartrate and citrate, in such a manner as to ensure a definite and constant chemical composition of these preparations.

Ferrous Tartrate. Fe C₄ H₄ O₆. In order to obtain this salt perfectly white, permanent in the air, and of a constant composition, equal weights of iron wire, tartaric acid, and hot water, are placed in a flask, and heated gently for a considerable while, taking care that the water lost by evaporation is replaced from time to time. Hydrogen is thus evolved, and a sandy white deposit formed, which is collected on a filter, washed with boiling water, and afterwards with alcohol, and then dried on filtering paper at a moderate heat. The complete washing of the precipitate is an essential point, for if the salt contain any free acid, it will become rapidly oxidized and discoloured on exposure to air.

Ferrous tartrate thus prepared is a white salt consisting of clear microscopic crystals, which will keep unaltered in closed vessels, even if exposed to light. Its composition corresponds to the formula above mentioned. It is readily soluble in dilute hydrochloric or sulphuric acid, and but sparingly soluble in tartaric, citric, or acetic acid. Its hydrochloric solution affects the plane of polarized light in the same manner as a solution of ferrous chloride to which tartaric acid has been added. Ammonia throws down from this solution a white precipitate, which rapidly assumes a greenish colour.

Ferric and Ammonic Tartrate. $2(\text{Fe O}, \text{N H}_4, \text{C}_4 \text{H}_4 \text{O}_6) + \text{H}_2 \text{O}$, dried at 100°C . Moist ferrous tartrate, when treated with an excess of solution of ammonia, forms a green solution of thick consistence, which rapidly absorbs oxygen from the air, causing the formation of the above named double salt, which, when allowed to dry on plates, is obtained in fine transparent garnet-red scales, which are not deliquescent, and are readily soluble in water. When dried over sulphuric acid, it contains four molecules of water, of which three are given off at 100°C .

Ferric and ammonic tartrate is generally prepared from ferric hydrate and bitartrate of ammonium, but this process involves much more trouble, and requires a great deal more time than the one just described, and moreover yields a preparation of a less constant composition, varying considerably in the amount of its N H_4 .

Ferrous Citrate. $\text{Fe H C}_6 \text{H}_5 \text{O}_7, \text{H}_2 \text{O}$. Very little is known respecting this compound and its properties. Gerhardt states that metallic iron dissolves in citric acid with evolution of hydrogen, and that the saturated solution produces, with alcohol, a white flaky precipitate of triferrous citrate; and this and similar statements occur in nearly all the handbooks on chemistry published within the last twenty years.

If a solution of citric acid is allowed to act upon finely powdered iron until it ceases to dissolve any more of the latter, the filtered solution, when mixed with two or three volumes of alcohol, will produce but a faint turbidity. But if the liquid is still very acid, the addition of alcohol causes the formation of a more voluminous flocculent and white precipitate, which absorbs oxygen while being washed, and assumes a dark green colour on drying. This preparation is a more or less oxidized triferrous citrate mixed with varying proportions of the biferrous salt.

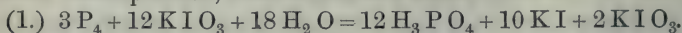
If ferrous citrate is prepared according to the directions given for the preparation of ferrous tartrate, it is obtained in a perfectly

white, gritty, crystalline condition, in which it can be washed with boiling water without suffering any change. It is not so stable, however, as the tartrate, as it absorbs oxygen upon drying, and is also affected by light. It is but little soluble in water. When incinerated it leaves 29.97-30.4 per cent. of Fe_2O_3 , which corresponds to the above formula.

Ferric and Ammonic Citrate. $2(\text{FeO}, \text{NH}_4, \text{H}, \text{C}_6\text{H}_5\text{O}_7) + \text{H}_2\text{O}$. Ferrous citrate dissolves in liquor ammoniæ with the evolution of much heat, forming a green solution, which rapidly turns yellow, and upon subsequent exsiccation on plates, leaves fine scales of the composition represented by the above formula. They are slightly hygroscopic, very soluble in water, and insoluble in alcohol, and can be easily preserved.

The Volatile Oil of the Root of the *Spiræa Ulmaria*. Dr. R. Nietzky. (*Archiv der Pharm.*, 1874, 429.) The author contradicts the statement made by Wicke, that the roots of the *Spiræa ulmaria* contain salicylous acid, and shows that the essential oil obtained from these roots is a compound ether of salicylic acid, which is heavier than water, and possesses the odour of the oil of *Gaultheria procumbens*, with which it is probably identical. The oil occurs both in the rhizome and in the rootlets, but only in very small quantities. From twenty pounds of the fresh root the author could not obtain more than one gram of the oil. The flowers contain salicylous acid, as was shown by Pagenstecher in 1834.

A New Reaction of Iodates. E. Polacci. (*Journ. f. pract. Chem.*, ix., 47; from *Gaz. Chim. Ital.*, 1873, 474.) The author's test is based on the fact that phosphorus reduces iodates to iodides, giving rise to the formation of phosphoric acid; the latter acting upon the undecomposed portion of the iodate and also upon the iodide formed, liberates iodic acid and hydriodic acid, which, by mutual decomposition, form iodine and water.



The solution to be tested is placed in a test-tube, and a small piece of phosphorus is added; if an iodate be present, the liquid surrounding the phosphorus will assume a deep yellow colour.

Red amorphous phosphorus reacts in the same manner, but still more energetically.

The Detection of Free Mineral Acids. Dr. F. Mohr. (*Neues Repert. f. Pharm.* xxiii., 257.) In cases of poisoning by mineral

acids, and in other instances (such as the testing of vinegar, etc.), it is important to decide whether the mineral acid indicated by Ba Cl_2 , Ag N O_3 , or other tests, is present in the free or in a combined state. The author recommends the following methods for the detection of small quantities of free mineral acids.

1. A solution of pure ferric acetate, free from alkaline acetates, is largely diluted with water, so as to appear pale yellow, and then mixed with a few drops of a solution of sulphocyanide of potassium. This mixture will change from yellow to red by the addition of the least trace of free $\text{H}_2\text{S O}_4$, H Cl , or H N O_3 . By placing the mixture in two test-glasses of equal size, and adding a little of the liquid to be tested for free acid to one of them, the least change in the colour can be seen by comparison. Phosphoric, acetic, tartaric, and citric acids do not produce this reaction, and the acetates of K, Na, or N H_4 prevent or destroy it. The test solution can only be prepared from perfectly pure ferric acetate, as the least trace of ferric chloride or sulphate would strike red with the sulphocyanide.

2. A mixture of pure iodide of potassium, starch paste, and solution of pure ferric acetate, has the red colour of the last-named solution, but turns blue on the addition of any free mineral acid. This test is extremely delicate, especially if the test mixture be slightly warmed in a test-tube before the acid is added. Citric and tartaric acid do not produce the blue coloration.

3. Free sulphuric acid may also be detected by soaking a piece of white filtering paper in the solution to be tested, and then drying it on a watch-glass in a water-bath; if $\text{H}_2\text{S O}_4$ be present, the paper will become black.

Another test for $\text{H}_2\text{S O}_4$ is based on the insolubility of all sulphates in alcohol. The liquid under examination is evaporated to a very small bulk, the residue treated with alcohol, filtered, and the alcohol removed from the filtrate by evaporation. If the residue gives any indication of $\text{H}_2\text{S O}_4$ with Ba Cl_2 , the acid must have been present in the free state.

Detection and Estimation of Hypochlorous Acid in the Presence of Chlorine, Chlorous Acid, and Chloric Acid. W. Wolters. (*Journ. f. pract. Chem.*, vii., 468.) A solution of free hypochlorous acid when shaken with mercury forms a brown crystalline oxychloride, Hg O Cl_2 ; a solution of free chlorine under the same conditions forms white mercurous chloride. H Cl O may therefore be detected in this way in the presence of chlorine, unless its quantity, as compared to that of the latter, is extremely small. If very little H Cl O is present, along with a large quantity of Cl , so that

the colour of the precipitate does not give any satisfactory result, the oxychloride may be separated from the subchloride by HCl , which will only decompose the former, and the presence of Hg in the filtrate will then be a proof of the presence of HClO in the original solution. If the solution contain hypochlorites instead of the free acid, the yellow mercuric oxide will be formed, which is also readily soluble in HCl . Chlorites and chlorates have no action upon metallic mercury. These reactions form the basis of the author's method for the quantitative estimation of hypochlorites in the presence of chlorine, chlorites, and chlorates. By shaking the solution with an excess of mercury for five minutes, the hypochlorites are completely decomposed, with the separation of mercuric oxide, which may be dissolved in HCl , and filtered. From the quantity of Hg found in the filtrate, that of the hypochlorous acid can be easily calculated.

The Estimation of Tannin. A. Terreil. (*Journ. de Pharm. et de Chim.*, 1874, 448.) The author gives a detailed account of a new method for estimating tannin, which is based upon the absorption of oxygen by tannin in the presence of an alkali. The quantity of oxygen absorbed is ascertained by direct measurement, and from this the amount of tannin is calculated. Though there are other vegetable substances which would absorb oxygen under the same conditions, the author considers his process as sufficiently accurate for technical purposes.

Note on Gentianin. B. J. Habermann. (*Ber. der deut. chem. Ges.*, 1874, 652.) Crystallized gentianin is a compound closely allied to maclurin. It is readily decomposed by fusing KHO , forming an isomeride of *protocatechuic acid*, $\text{C}_7\text{H}_6\text{O}_4$, besides *phloroglucin* $\text{C}_6\text{H}_6\text{O}_3$, and acetic acid.

A Practical Method for the Analysis of Sugar of Lead. Dr. R. Fresenius. (*Zeitschr. f. analyt. Chem.*, 1874, 30.) The solution of a weighed quantity (about five grams) of sugar of lead is placed in a graduated cylinder, and the lead precipitated from it by a slight excess of standard sulphuric acid, containing one equivalent of SO_3 in grams per litre. The mixture is then made up to 250 c.c. by the addition of water, and besides this a further quantity of water, equal to the volume of the sulphate of lead is added. The latter may be ascertained by dividing the approximately calculated weight of the sulphate by its specific gravity (6.3); for 5 grams of sugar of lead, about 0.6 c.c. of water would be equal to the bulk of the PbSO_4 . The whole amount of the acetic acid and the excess of H_2SO_4 are thus contained in 250 c.c. of solution.

In a measured portion of the clear liquid the H_2SO_4 is now determined by BaCl_2 , and the quantity found to be present in the 250 c.c. deducted from that originally used; the difference represents the H_2SO_4 required for precipitating the lead, from which the quantity of Pb is readily calculated.

The excess of H_2SO_4 being now known, the acetic acid may be estimated in a measured portion of the clear liquid by means of a standard solution of NaHCO_3 .

A number of experiments quoted by the author show that his method gives very accurate results.

The Manufacture of Valerianic Acid. M.M. Pierre and Puchot. (*Annal. de Chim. et de Physique*, 4th series, xxix., 228). Instead of the direct conversion of amylic alcohol into valerianic acid, the authors recommend its intermediate conversion into valerianate of amyl. The following is the *modus operandi* proposed:—

1400 grams of sulphuric acid diluted with 800 grams of water are gradually added to a mixture of $3\frac{1}{2}$ kilog. of water, 1 kilog. of powdered bichromate of potassium, and one litre of purified amylic alcohol, stirring well, and surrounding the vessel with cold water so as to keep the temperature at 11° – 12°C . After all the acid has been added, the mixture is allowed to stand for 24 hours, during which a mixture of valerianate of amyl and small quantities of undecomposed amylic alcohol, amylic aldehyde, and valerianic acid collects on the surface, while crystals of chromium alum separate at the bottom. The ethereal liquid is removed from the surface and distilled, the portion passing over at 175° – 192° being collected separately. This purified valerianate of amyl is now added very gradually to a concentrated solution of KHO contained in a retort; water is then added, and the regenerated amylic alcohol recovered by distillation. The concentrated solution of valerianate of potassium is next slowly evaporated to dryness, the residue decomposed by H_2SO_4 and the liberated acid distilled.

According to the authors, the boiling point of the pure monohydrated acid is 178°C ., which is somewhat higher than that stated by other investigators (Delffs 174° , Kopp 175.8°).

Volumetric Estimation of Silver. B. J. Volhard. (*Zeitschr. für analyt. Chem.*, 1874, 17.) The acid silver solution is mixed with a solution of ferric sulphate, and a standard solution of sulphocyanide of ammonium is added to this mixture, until a permanent red coloration is produced, which does not take place until all the silver has been precipitated as sulphocyanide. The first drop of the

standard solution which is added beyond the quantity required for the precipitation of the silver indicates the end of the reaction in a most distinct manner. This method is very exact, and possesses the great advantage of being applicable to acid solutions. It may also be used for the estimation of silver in alloys.

Artificial Formation of the Aromatic Principle of Vanilla. F. Tiemann and W. Haarmann. (*Pharm. Journ.*, 3rd series, iv., 996; from *Ber. der deut. chem. Ges.*, 1874, 608.) In a lengthy and elaborate paper recently published, an abstract of which has also been read before the French Academy,* the authors describe their researches upon coniferin, from which body they have succeeded in producing artificially a substance identical with vanillin, the aromatic principle of vanilla. The following abstract will present the chief points of interest to our readers.

Among the numerous glucosides of vegetable origin there is one, coniferin, which for a long time escaped the notice of chemists and physiologists, although it is found in considerable quantity in the members of one of the most widely distributed orders of plants. This body was first found in 1861 in the juice of the cambium of the *Larix europæa*, by Hartig,† who for that reason called it "laricin." Afterwards, its presence being recognized in the cambium of all the pines, the names of "abietin" was conferred upon it. Finally, as it appeared to exist in all the Coniferæ, W. Kubel,‡ who was the first to study it chemically, with the consent of Hartig, again changed the name to coniferin.

Coniferin may be prepared in the following manner. At the time of the formation of the wood, in the spring or early summer, such conifers as *Abies excelsa* and *A. pectinata*, *Pinus strobus* and *P. Cembra*, *Larix europæa*, etc., are felled, and the trunks are sawn into several pieces and afterwards barked. The juice of the cambium is collected by scraping the wood with a sharp instrument such as a piece of glass. This juice is boiled and filtered to eliminate albuminous matters; then evaporated to about one-fifth its original volume. After a time it deposits brown coloured crystals, which are pressed, and purified and decolourized by repeated recrystallizations and treatment with animal charcoal. The greater part of the impurities may be removed by treating the brown solution of coniferin, whilst still warm, with small quantities of acetate of lead and ammonia; the resinous and colouring matters being precipi-

* *Comptes Rendus*, lxxviii., 1365. † *Jahrbuch für Forster*, 1861, i., 263.

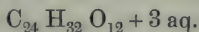
‡ *Journal für praktische Chemie*, xcvii., 243.

tated, whilst the coniferin remains in solution. Excess of acetate of lead may be easily removed by means of a current of carbonic acid gas.

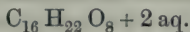
Coniferin is slightly soluble in cold water, more soluble in hot water and in alcohol, but is not soluble in ether. It crystallizes upon cooling in white, transparent, brilliant, sharp-pointed crystals, frequently grouped in a star or rosette. Its fusing point is 185° C. These crystals become opaque and dull in contact with air, losing part of their water of crystallization, which is driven off completely at 100° C. The aqueous solution of coniferin is bitter, lævogyrous, and does not reduce Fehling's solution even after prolonged boiling. It is not altered by dilute acid in the cold, but when heated with a few drops of hydrochloric or sulphuric acid, the solution deposits a white resinous matter, which in drying ordinarily becomes yellow or orange, whilst glucose is then found in the liquor. In contact with strong sulphuric acid, coniferin is at first coloured deep violet, and afterwards dissolved, communicating to the liquid a red colour; upon the addition of water an indigo blue resinous matter is precipitated. If strong sulphuric acid be poured, a little at a time, into an aqueous solution of coniferin, as the temperature rises there is formed a deposit of the white resinous matter above mentioned; then the liquid becomes violet and turbid, and, after the addition of a considerable quantity of the acid, a clear dark red solution is obtained, as in the preceding case.

Moistened with carbolic acid or concentrated hydrochloric acid, after some time coniferin acquires an intense blue colour; in the sunlight this coloration [is almost instantaneous. It is upon this reaction that the use of pine wood as a test for carbolic acid is based.

Kubel ascertained that coniferin is a non-nitrogenous body, which is confirmed by the author's researches; but not having isolated, with the exception of glucose, any of the products of decomposition he could not assign to it any definite formula, though his analyses led him to consider it as—



After a close investigation of the substance by Messrs. Tiemann and Haarmann they have represented the molecule of coniferin by—

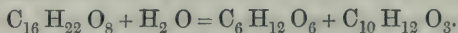


which agrees very closely with the figures required by Kubel's formula.

In order to determine the chemical constitution of coniferin, the authors sought first to determine the nature of the product or pro-

ducts resulting from its decomposition with elimination of glucose. As before stated, dilute hydrochloric or sulphuric acid, aided by heat, split it up into a resinous matter and glucose; but the properties of the resinous matter so obtained not appearing sufficiently definite, it was determined to effect the decomposition by fermentation by means of emulsion. For this purpose 50 grammes of pure coniferin were placed in 500 grammes of water, 0.2 to 0.3 grammes of dry emulsion added, and the mixture kept at a temperature between 25° and 26° C. The action commenced immediately, and in a few hours the presence of glucose in the liquor could be detected. The undissolved crystals of coniferin gradually disappeared, and in their place were deposited at the bottom of the vessel white flocks, which were distinguishable from coniferin by their solubility in ether. After six or eight days the process of fermentation terminated, and by that time the bottom of the vessel was covered by a thick layer of this crystalline matter, the supernatant liquor being clear and slightly coloured. The liquor containing the precipitate was shaken with ether, which removed the flocks, and upon evaporation generally left a residue of well formed white prismatic crystals. Sometimes, however, it left an oily residue, from which crystals were obtained upon cooling by a freezing mixture. The crystals were pressed between filtering paper, and purified by recrystallization from ether. The aqueous solution, having had any remaining emulsion removed by coagulation by heat and filtering, was found to contain in solution only glucose, and, it may be, slight traces of undecomposed coniferin.

The product of decomposition, chemically pure, melts at 73°–74° C. It is soluble in ether, less soluble in alcohol, difficultly soluble in hot water, and nearly insoluble in cold. It is represented by the formula, $C_{10}H_{12}O_3$, and is derived from coniferin according to the following equation:—



If this body be dissolved in dilute alcohol, and a few drops of sulphuric or hydrochloric acid added, a white flocculent amorphous precipitate is produced, which is less soluble in ether and alcohol, but has the same composition, and is considered by the authors to be a polymer of the original decomposition product.

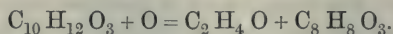
The crystalline product is soluble in caustic soda, from which it is precipitated by acids in the amorphous form, and this is again redissolved by the alkaline solution. Like coniferin it is coloured red by sulphuric acid, and, in dissolving, colours the liquid red; but it does not give the violet reaction characteristic of the glucoside.

The pure crystalline product, when recently prepared, is quite inodorous, but after a time acquires a feeble, though well characterized, odour of vanilla. The same odour is produced when either of the decomposition products or coniferin is heated with dilute sulphuric acid, and still more clearly when an oxidizing mixture of sulphuric acid and solution of bichromate of potash is used. The crystalline decomposition product, reduced to fine powder, was therefore triturated with water, sulphuric acid and bichromate of potash in solution added, and the mixture distilled. At first a liquid, smelling strongly of ethylic aldehyde, was obtained, in which the presence of that aldehyde could be detected. The next portions did not present this character, but were strongly acid, and diffused a well-characterized odour of vanilla. From these portions of the distillate, ether removed a body which crystallized in stellate groups of crystals, possessing in a high degree the odour and taste of vanilla.

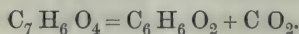
Operating in this way the yield was very small, in consequence of the rapid resinification of the decomposition product under the influence of the sulphuric acid, and in this state it was only slowly and partially attacked by the oxidizing mixture. It was found more easy and advantageous to operate directly upon coniferin. This was done by pouring an aqueous solution of coniferin into a hot mixture of bichromate and sulphuric acid, and heating the whole together for several hours in a flask furnished with a returning condenser. After cooling, the liquid was filtered to eliminate a little resinous matter which was deposited, and then agitated directly with ether. Upon distilling or evaporating this solvent a yellowish oil was obtained, which, after some days, formed a crystalline mass. By recrystallizing this from water, and decolourizing with a little animal black fine crystals were obtained, having the odour and taste of vanilla. They melted at 80° to 81° C., were readily soluble in ether and in alcohol, difficultly soluble in cold water, and more soluble in hot water. Their composition was represented by the formula $C_8H_8O_3$. In fact, this body presented the same properties and was identical in composition with vanillin or vanillic acid, the substance to which vanilla owes its aroma. Vanillic acid was a short time since studied by M. Carles,* who prepared from it a series of salts having the general formula $MC_8H_7O_3$, in which M represents one equivalent of a metal; he also prepared iodine and bromine substitution products. The facts observed by him are stated by the authors to accord exactly with those observed by them

* *Pharm. Journ.*, 3rd series, iii., 407.

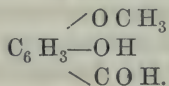
in operating upon vanillin prepared from coniferin. The transformation of the product of decomposition is represented by the following equation :—



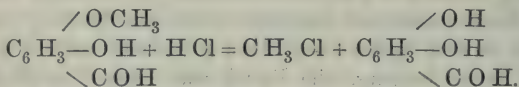
In order to elucidate the nature of vanillin it was fused with caustic soda. The product of this reaction was pyrocatechuic acid $\text{C}_7\text{H}_6\text{O}_4$. This was further identified by its transformation into pyrocatechuic acid, $\text{C}_6\text{H}_6\text{O}_2$, by the separation of a molecule of carbonic acid :—



The conversion into protocatechuic acid fixes the constitution of vanillin; this compound is the methylic aldehyde of protocatechuic acid, the molecule of which is expressed by the formula :—

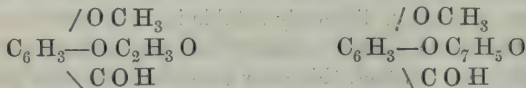


In fact, submitted to the action of hydrochloric acid under pressure vanillin splits up into methylic chloride and protocatechuic aldehyde :—



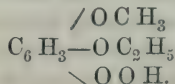
An analogous reaction takes place with hydriodic acid; but in that case the aldehyde undergoes a more profound alteration.

Another proof of the correctness of this theory was obtained in treating vanillin with acetic anhydride and chloride of benzoyl. The prolonged action of these agents only produced the bodies

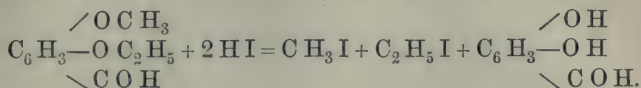


This the authors consider a clear demonstration that the molecule of vanillin contains only a single hydroxylic group.

The constitution of vanillin being cleared up, the structure of the fermentation product, the oxidation of which engendered vanillin, became evident. This product is the ethylic ether of vanillin :—



This formula explains the disengagement of ethylic aldehyde during formation of the vanillin. Moreover, in operating upon the fermentation product under pressure with hydriodic acid, alcoholic iodides were obtained in considerable quantities, which could be separated by suitable means into methylic and ethylic iodides:—



Messrs. Tiemann and Haarmaan carried on this investigation in the laboratory of Dr. A. W. Hofmann, at Berlin.

Iodide of Potassium from Cuprous Iodide. G. Langbein. (*Pharmaceut. Zeitung*, July 15th, 1874; from *Ber. der deut. chem. Ges.*, 1874, 765.) The author states that cuprous iodide, which is now being extensively imported from Peru, is an excellent basis for the preparation of pure iodide of potassium, as it contains from 60 to 66 per cent. of iodine, and may be converted into the potassium salt without much trouble or expense. He recommends the following process:—

The finely powdered cuprous iodide, after being freed from all soluble matter by washing it with water, is suspended in water slightly acidulated with HCl, and then decomposed by a current of sulphuretted hydrogen. Hydriodic acid and cuprous sulphide are thus formed, and this decomposition may be considered as complete as soon as the deposited Cu_2S appears free from white particles of CuI. After the excess of H_2S has been removed by solution of iodine in iodide of potassium, the solution of HI is separated from the precipitated Cu_2S by decantation, neutralized by K H C O_3 , and concentrated by evaporation, when the sulphur which was left in suspension will agglomerate, so that the concentrated clear solution can be poured off from it, and allowed to crystallize.

This method has the following advantages:—Large quantities of iodide of potassium may be prepared in a very short time; there is no loss of any kind, and the expenses are covered by by-products. The pure ferrous sulphate obtained in producing the H_2S will pay for the $\text{H}_2\text{S O}_4$ and FeS; and the sulphate of copper obtained by roasting the sulphide will cover the expenditure for carbonate of potassium, wages, and fire.

It is necessary that the solution of hydriodic acid should be decanted from the Cu_2S , as soon as the latter has settled down, as otherwise copper may pass into solution by the oxidation of the sulphide.

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PHARMACY.

PART III.

PHARMACY.

The Action and Uses of Croton-Chloral Hydrate. Dr. O. Liebreich. (*Brit. Med. Journ.*, Dec. 20.) The author directs attention to a new remedy, which serves to corroborate the theory propounded by him with respect to the action of hydrate of chloral.

When chlorine gas acts on aldehyde, croton-chloral is formed, as has been demonstrated by Dr. Krämer and Dr. Pinner. In order to avoid a mistake which is apt to be caused by the name, attention must be paid to the fact that this body possesses no relation whatever to croton oil, although its chemical constitution proves it to be the chlorated aldehyde of crotonic acid. Croton-chloral differs in its outward appearance from hydrate of chloral by its being dissolved with difficulty in water, and by its crystallizing in small glittering tablets. Its action, though similar to that of hydrate of chloral, differs widely from the latter with regard to its physiological effects. Four grams, or a drachm, of this substance, dissolved in water and introduced into the stomach, produce in the course of from fifteen to twenty minutes a deep sleep, accompanied by anæsthesia of the head. Whilst the eyeball has lost its irritability, and the *nervus trigeminus* shows no reaction whatever on being irritated, the tone of the muscles remains unaltered.

Maniacs who have been treated with this medicine during an attack of mania, have remained quietly sitting on their chairs in a deep sleep, their pulse and respiration being unchanged, for two whole hours together. If anæsthesia had reached so high a degree in consequence of the application of hydrate of chloral, the patients would have dropped from their chairs, and both their pulse and respiration would have been considerably retarded. The author has known croton-chloral to act in the same way on healthy individuals. In some cases of *tic douloureux*, the remarkable phenomenon is exhibited that pain ceases before sleep sets in. Although this remedy acts only as a palliative in this dreadful disease, its use is preferable to that of morphia, because it has effects as good as the latter remedy, without being so detrimental to the constitution in general.

No unfavourable effects of croton-chloral on the stomach or on any other organ have been noticed by the author, although he has made frequent experiments with it.

The indications for the use of this remedy are to be found—1. In cases where hydrate of chloral is inapplicable on account of heart disease. 2. In cases of neuralgia in the district of the nervus trigeminus. 3. In cases where very large doses of chloral are necessary to produce sleep, in which case the author recommends the addition of croton-chloral to hydrate of chloral.

Whilst examining the difference between the action of hydrate of chloral and that of croton chloral, a remarkable fact has been noticed by the author, viz., that it is not the first, but the second product of decomposition of the latter substance which is brought into action, on account of the first being too rapidly destroyed. Croton-chloral, when subjected to the influence of an alkali, first forms allyl-chloroform, a trichlorated body, which is rapidly decomposed into a bichlorated substance called bichlor-allylene. Now, both chloroform and trichlorated substances act in their first stage upon the brain, in the second on the spinal cord, and in the third, on the heart. The retardation of respiration is to be explained by the agency of these substances on the last-mentioned organ. Bichlorated substances act differently, as is proved by bichloride of ethylene. Even if the circulation of the blood in an animal have been stopped by this latter agent for one minute, life may be restored by artificial respiration, which is impossible whenever trichlorated substances have produced this effect, in which case the muscles of the heart remain paralyzed. In the case of animals poisoned by croton-chloral to such a degree that both circulation and respiration are stopped entirely, artificial respiration is able to restore the action of the heart immediately, and the life of the animal may thus be saved. Bichlor-allylene, inhaled by the lungs, produces the same effect on animals as croton-chloral. We thus see these bichlorated substances acting on the brain, spinal cord, and medulla oblongata, but not on the heart, which explains the fact that both respiration and circulation remain unaltered in man by a medicinal dose. It is a highly interesting fact, however, that under favourable conditions we still are able to produce in animals the effects of the first product of decomposition of croton-chloral, i.e., of the trichlorated substance, or of allyl-chloroform. In order to observe these effects, it is necessary to introduce immense doses of croton-chloral into the body, when paralysis of the heart actually does ensue.

Croton Chloral. Alfred H. Mason, F.C.S. (*Chem. and*

Drug., 1874, 2nd series, 45.) This new remedy, introduced into medicine by Dr. O. Liebreich, was discovered somewhat accidentally by Dr. Krämer and Dr. Pinner, who were carrying out experiments on the action of chlorine on aldehyde.

Chlorine was passed into aldehyde, at first carefully cooled in a freezing mixture, and only heated at 100° at the close of the reaction. The first few bubbles caused the separation of a small quantity of solid met-aldehyde, whether originally present in the aldehyde, or formed by the reaction, is undecided. After a short time evolution of hydrochloric acid set in, and every trace of chlorine was absorbed. With 100 grains of aldehyde, at the end of twenty-four hours, no further absorption took place even at 100° . The resulting brown mass consists of two layers; a lower, darker, almost solid; and an upper, lighter coloured, liquid layer. The latter is a saturated solution of hydrochloric acid and the bodies of the lower layer in water. As it was found impossible to separate these two well, the whole was submitted to distillation. A considerable quantity passed over between 90° and 100° ; the thermometer then rose rapidly to 160° , and the main product distilled over between this and 180° ; the temperature again rose to about 240° , but only decomposition products were obtained, and a considerable carbonaceous residue remained in the flask. By means of fractional distillation the portion boiling at 160° to 180° was quickly purified, and a body boiling at 163° to 165° was isolated, which proved to be crotonic chloral.

In passing perfectly dry chlorine gas over pure aldehyde (C_3H_4O)—the action is very violent, and many precautions have to be taken to prevent explosion, and to condense the volatile products of the reaction, and still to allow the enormous quantities of hydrochloric acid gas to escape. After a time the liquid thickens; at this stage the current of chlorine can be passed through the liquid. After another interval it becomes necessary to warm, and at last to boil the liquid through which the chlorine is passing. At length hydrochloric acid ceases to be evolved, and crude croton-chloral is obtained—the process taking about 48 hours to complete. This crude body is *mainly* ordinary chloral, but mixed with a variety of other products. By fractional distillation and treatment with sulphuric acid—true croton chloral ($C_4H_3Cl_3O$)—tri-chlorcrotonic aldehyde is obtained. This is a dense oily liquid of peculiar odour, somewhat recalling ordinary chloral; treated with a considerable excess of warm water it hydrates and dissolves, and upon cooling, croton-chloral hydrate ($C_4H_3Cl_3O, H_2O$) is deposited, but still in a crude form, most rank and offensive in flavour. It has to be

purified by rather a tedious process, and is obtained, when pure, in beautiful white silvery crystals, with a sweetish melon flavour, which melt at 78°C .

Croton-chloral is the substance represented by the same term in the allyl (C_3H_5) group that chloral has in the ethyl (C_2H_5) group. Its outward appearance differs from hydrate of chloral by the salt being much lighter, and in flocculent silvery crystals—by its being almost insoluble in cold water and very soluble in alcohol; it is soluble in hot distilled water, and rendered more easily so by the addition of 25 per cent. of pure glycerin: it is insoluble in chloroform.

Dr. Yeo, of King's College Hospital, London, who has thoroughly investigated the value of this medicine, speaks very highly of its palliative effects in obstinate forms of neuralgia, diffused muscular pain, and the distressing night cough of chronic phthisis. The dose ranges from one to ten grains, but doses of from two to three or five grains are recommended to be given and to be repeated every hour until the amount of tolerance in the medicine in each particular case has been discovered.

The following formula yields the strongest solution that is permanent.

Croton-Chloral Hydrate	64 grains.
Pure Glycerin	$\frac{1}{2}$ ounce.
Hot Distilled Water	$1\frac{1}{2}$ ounce.

The author fully endorses Dr. Yeo's statement as to the value of glycerin in making solutions suitable for dispensing.

A syrup can be made containing two grains of croton-chloral hydrate in the fluid dram, by adding four ounces of simple syrup to the above solution, and the disagreeable taste may be removed by any flavouring the pharmacist sees fit to add.

Chloral Hydrate and Camphor. J. F. Brown. (*Pharm. Journ.*, 3rd series, iv., 729.) When camphor in fine powder is rubbed in a mortar with an equal weight of pure crystallized hydrate of chloral, the mass becomes damp, and slowly dissolves, to form a syrupy liquid, strongly resembling glycerin in appearance.

A rise in temperature of about 3°F . accompanies this change, showing that a chemical reaction of some kind must evolve heat more than sufficient to counterbalance the loss of sensible heat which always attends the passage of a substance from the solid to the liquid state.

No acid or irritating fumes, however, were perceptible during the solution, and the resulting liquid was neutral to test-paper.

It was unaffected by solution of silver nitrate, left a greasy stain when dropped upon paper—permanent for some hours—and retained the taste and smell of its components.

A slip of paper dipped into it did not ignite very quickly when brought near a light, but burnt with a bright white flame, having emerald-green edges.

It was readily soluble in alcohol and ether, but distilled water converted it into a soft translucent solid, from which, after some time, hydrate of chloral appeared to be dissolved out, leaving the camphor in crystallized grains.

These facts appear to point to an abstraction of water by the camphor, and solution of the latter in the liberated chloral; but such an avidity for water is not shown by camphor under ordinary circumstances, and the cause of this curious liquefaction is not easily discernible.

To the above the editor of the *Pharmaceutical Journal* adds the following note:—

Some time since the *Medical Record* quoted from an American source a statement, that if camphor be powdered by rubbing it in a mortar with a few drops of spirit, and an equal weight of chloral hydrate added, a liquid is produced which is a valuable local anæsthetic. Mr. Lennox Browne (*British Medical Journal*, 1874, 304) confirms this statement, and says that it is of the greatest value as a local application in neuralgia. He has found great and sometimes instantaneous relief to follow its application in every case in which he has applied it. It is only necessary to paint the mixture lightly over the painful part and allow it to dry. The application never blisters, though it may occasion a tingling sensation of the skin. The compound has also been found of great service in the relief of toothache.

The Preparation of Extract of *Krameria*. M. Castueil-Patteson. (*L'Union Pharm.*, xv., 66.) Some large roots of *Krameria*, from which the author wished to obtain the extract of this substance, having been dried for that purpose, probably at too high a temperature, yielded, when macerated in water and percolated, a dull yellow instead of a red liquid. When, however, sugared water was substituted for pure water, and heat applied, an extract was obtained, consisting of equal parts by weight of sugar and of extract of *krameria*, which was convenient as a pill mass, and could be rendered hard by being placed in a stove. The author has obtained a perfectly limpid solution from some which had been prepared in this manner, and which had been kept for two years.

The heat of the hand, or, if necessary, exposure for a few minutes to the vapour of water, will reduce the mass to a suitable consistence for making pills. Thus, pills can be obtained, which are quickly and easily made, retain their shape, contain no injurious substances, and dissolve perfectly in the stomach.

In order to obtain a fluid extract of *krameria*, the author proceeds as follows:—

Moisten one kilogram of *krameria*, which has been reduced to a coarse powder, with one litre of rain water, to which 50 grams of crystallized sugar and 100 grams of pure glycerin have been added; after contact for 12 hours, percolate with four to five litres of rain water, containing in solution 100 grams of sugar and 50 grams of glycerin; evaporate the liquid to the consistence of clear syrup; allow it to cool; filter, and continue the evaporation till it attains the consistence of thick syrup, which will contain about 330 grains of the extract of *krameria*.

Adulteration of Linseed Oil with Cod Oil. Aug. Morell. (*Pharm. Centralhalle*, xiv., 337.) Besides many other adulterations of linseed oil, one by means of cod oil, deprived of smell, has been practised lately, more especially in the case of oil intended for the preparation of printer's ink. Owing to the proportion used of the adulterant, its presence cannot be recognised by the smell or by external appearance.

In order to prove the adulteration in a very simple manner, 10 parts by weight of the oil to be tested are poured into a small cylindrical glass, with about three parts of crude nitric acid, well stirred with a glass rod, and the whole left to stand, when the oil and the acid will soon become separated.

Should the linseed oil be adulterated with cod oil, it will be found that after standing for some time, the layer of oil appears of a dark brown or blackish brown colour, whereas the acid at the bottom of the vessel will assume a light orange to orange or dark yellow colour, according to the amount of cod oil present. As little as three per cent. of the adulterant can thus be distinctly recognized.

If the oil under examination is pure and unadulterated, it will change its colour during the stirring, first into a sea-green and afterwards into a dirty greenish yellow, whilst the separated acid assumes a light yellow colour.

On Glycerate of Sucrate of Lime and Chalk Liniment. M. Latour. (*Répert. de Pharm.*, i, 557.) The author, who is a pharmacien principal of the military hospital of Saint Martin, in Paris, had for a long time employed a solution of sucrate of lime for burns

and other inflammations of the skin; but finding that carbonate of lime was formed, through the absorption of carbonic acid from the air, he made a series of experiments in order to find the limit of solubility of sucrate of lime of glycerin. While doing this he produced a dense product of a constant composition, which he has called saturated glycerate of sucrate of lime. This substance, applied to the skin, at first appears to be a kind of varnish, which afterwards coagulates, and falls off in pieces, when perspiration takes place. It is principally beneficial by the coolness which it imparts to those parts of the skin which are inflamed.

A nearly saturated solution of glycerate of sucrate of lime of a density of 1.280 at 15° C. can be prepared in the following manner:—

Mix thoroughly 400 grams of powdered sugar together with 200 grams of slacked lime in a mortar; add 2 kilograms of water in small portions, so as to obtain a clear pulp, taking care at the same time to avoid the formation of lumps; after leaving this mixture in a stoppered flask for 24 hours, filter, and add 400 grams of glycerin to the solution. In order not to retard the filtration, it is necessary not to add the glycerin until the sucrate of lime has been filtered. When the glycerin has been added to the filtered sucrate of lime, evaporate until the whole quantity is reduced to one litre. The saturated glycerate of sucrate of lime thus obtained contains in 100 cubic centimetres 7.716 grams of lime = 56.55 grams of dry sucrate of lime; and in 100 grams it contains 6.720 grams of lime = 49.42 grams of dry sucrate of lime. Coagulation is not produced by boiling, but takes place on the addition of four volumes of water. The drying qualities of glycerate of sucrate of lime are improved by dissolving about three per cent. of gelatine in it under the influence of heat.

In preparing chalk liniment, the author recommends the use of this glycerate of sucrate of lime in the dilute state, before the evaporation above mentioned has taken place.

The following figures show the relative densities and amounts of lime and sucrate of lime contained in the dilute and in the concentrated solutions respectively.

	Concentrated.	Dilute.
Density at 15° C.	1.280	1.144
In 100 c.c. : Lime	7.716 grams.	3.512 grams.
„ „ Dry Sucrate of Lime	56.550	26.050 „
In 100 grams : Lime	6.720	3.289 „
„ „ Dry Sucrate of Lime	49.420	24.190 „

In order to prepare the liniment from the glycerate of sucrate of

lime, mix 200 grams of ground-nut oil with 100 grams of the dilute glycerate in a vessel having a large mouth.

To obtain a mixture a little less solid, oil of sweet almonds may be used instead of the ground-nut oil, or in some exceptional cases the simple oil may be replaced by camphorated oil, in order to counteract the odour given off from the constant suppuration of severe burns.

The author recommends this new chalk liniment very highly, not only because a large quantity can be prepared in a very short time, but also because, owing to the substances which it contains, it can be applied with advantage to erythema, erysipelas, variolic eruptions, and chilblains, as well as to severe burns. Its principal properties are protection of the injured surface from the air, diminution of the pain, modification of the suppuration, and hastening of the cicatrization. There is no difficulty in using it, and it occasions no pain to the patient. It has already been advantageously employed in cases of severe burns and of erysipelas of the face.

The Application of Ergot for Hypodermic Injections. Dr. E. R. Squibb. (From the author's paper on "Ergot and its Preparations, read before the American Pharmaceutical Association, at Richmond, Sept., 1873.)

In January of 1869, Professor Langenbeck, of Berlin, first used what is loosely described as an "aqueous solution of secale" by hypodermic injection, in the treatment of aneurisms, with marked advantage. This practice is described in the Berlin *Klinik Wochenschrift*, and an epitome of the paper is published in *Ranking's Abstract*, for July, 1870, p. 223. In the same Berlin journal, for 1872, Dr. Hildebrandt published the results of hypodermic injections of ergotin in the treatment of uterine fibroid tumours. This paper is epitomized in *Ranking's Abstract*, for January, 1873, p. 248. This treatment when tried in this country seemed to be difficult and uncertain, for want of a trustworthy and uniform preparation, which should fairly represent ergot, and be adapted to hypodermic use; and at the request of Drs. J. Marion Sims, of New York, and W. C. Wey, of Elmira, the writer undertook what seemed to be a hopeless task, of making a preparation well adapted to hypodermic use.

Disbelieving in the existence of any separable active principle in ergot at all analogous to the morphia of opium, no preparation seemed available except an extract which should be soluble in an aqueous menstruum. Then knowing the difficulty with which non-diffusible extractive matters are absorbed when deposited in the sub-

cutaneous cellular tissue, and the liability of such matters, however bland, to cause troublesome abscesses, the problem seemed to be impracticable. After a good deal of time and trouble given to the matter, and many complicated trials, which need not be detailed, the best practical result reached was that of making a solid extract of ergot by the evaporation of the fluid extract of the U.S. Pharmacopœia of 1860, at a very low temperature, by mechanical stirring.

If this fluid extract, carefully made by repercolation from good rye ergot, without any heat, be evaporated in a shallow capsule in a bath of water of $50^{\circ}\text{C.} = 122^{\circ}\text{F.}$, by active and continuous stirring, until it is reduced to one-sixth of the weight of the original fluid extract taken, the result will be a spongy extract of a light brown colour, full of air incorporated by the mechanical agitation, and looking a little like pulled molasses candy. This extract has the full odour and taste of the fluid extract, concentrated by condensation, and probably has the full therapeutic value of the ergot from which it is made; and each grain of it represents six minims of the fluid extract, or six grains of the ergot from which the fluid extract was made. It is quite insoluble in cold stronger alcohol, but entirely soluble in diluted alcohol, and also is easily soluble in water, with the exception of an insignificant residue, which is easily filtered out. Its solutions are slightly acid to litmus paper, and have their ergot odour strongly increased by the addition of alkalies. The concentrated solution in water is turbid before filtration, but after filtration is of a deep rich garnet-brown colour. How this extract or its solutions will keep is of course unknown, but the probabilities of keeping unchanged are quite favourable in regard to the extract, but unfavourable for the aqueous solution. A five-grain pill of this extract of course represents the mean dose of thirty minims of fluid extract, or thirty grains of ergot, and it is not only much more easily taken, but in delicate conditions of stomach is much less liable to produce nausea, loss of appetite, etc. It does not, however, always agree better with sensitive stomachs than the fluid extract, nor does the stomach always tolerate it much longer. Hence it is very desirable often to relieve the stomach altogether for a longer time than the brief intermissions that can be permitted without losing ground already gained by the treatment; and to effect this, hypodermic and topical administration may be resorted to. Hypodermic medication is merely a short cut into the circulation, whereby the process of digestion and assimilation and the organs by which this process is effected are avoided, the absorption taking place

directly from the cellular tissue. Hence the therapeutic action is more prompt; and in the case of medicines which are liable to decomposition in the process of digestion, or to loss by entanglement with the fecal matters, smaller quantities are required to produce a given effect. But then, as most medicines are irritant, or at best liable to act as foreign bodies when introduced under the skin, they will more or less frequently cause abscess and painful irritation, and this in proportion to quantity, irritant nature, and their being more or less loaded with matters which are not diffusible. The filtered aqueous solution of this extract of ergot, though not well adapted to hypodermic use, is better adapted to it than the fluid extract, and perhaps is as well adapted as any preparation of the drug can be under the supposed required conditions. Such a solution has been used in this way with variable success. In some hands it seems to have been moderately successful, in others less so, while in some it has produced abscess so often that it was soon abandoned. The solution may be made of almost any desired strength, but that which seems to have answered best is the same as the fluid extract, or a minim for each grain of ergot represented in the extract. To make this solution, sixty grains of the extract is weighed into a small vessel, and dissolved in about four fluid drachms of water by stirring. It is then poured into a small wet filter supported over a vial marked for containing just six fluid drachms, and when the liquid has passed through, the filter is rinsed through with water until the measure of six fluid drachms is reached. This solution should be made every week or two, or in the summer more frequently, until its permanence be ascertained. If desired, it may easily be made of double the above strength by halving the proportion of water, but what is thus gained in the quantity of the injection is perhaps overbalanced by the disadvantages of density in retarding the absorption.

This same solution seems well adapted to use as a topical application; the desired dose being put upon a dossil of cotton-wool, and this applied to the os uteri, with another dossil behind it. It might be inferred that this would be a very imperfect method of administration, and when first proposed by Dr. Wey as an alternative method, the writer predicted its failure, not being then aware of a somewhat similar practice in Germany as long ago as 1836. Dr. Wey, however, succeeded well, and produced the characteristic uterine colic within two hours or less. This topical method may also be used by means of suppositories, and the best vehicle for the extract seems to be the mixture of gelatine water and glycerin,

which, when in proper proportions, make a very firm jelly, that does not become hard, and keeps indefinitely. Besides, it melts at a gentle heat, and is readily soluble in aqueous liquids. This is but a nicer and more simple form of the compound used for the inking rollers of printers. It seems not improbable that oleic acid might be used as a vehicle for this extract, thus adapting it to dermic administration; but as yet no trials have been made.

Protection of Hypodermic Solutions from Change. Dr. Squibb. (From a paper read before the American Pharmaceutical Association, Sept., 1873.) The author has made numerous experiments, with the object of ascertaining the extent to which carbolic acid will prevent the growth of *conservæ* in hypodermic solutions. (*Pharm. Journ.*, 3rd series, iv., 837.) He found, that when such solutions are properly made, the smallest proportion of carbolic acid which will protect them from change, is about one-seventh of one per cent.; but that a proportion of one-sixth of one per cent. is practically better and safer in ordinary practice; and that this latter proportion is unobjectionable in all known respects. To make these solutions with this proportion, the following formulæ are suggested. First, to make a five per cent. solution of carbolic acid, which is useful for this and many other purposes.

Take of crystallized carbolic acid 10 parts, or 10 grammes, or 54 grains, distilled water 200 parts, or 200 grammes, or 3086 grains. Weigh the distilled water in a glass-stoppered bottle, capable of holding one-fourth more than the sum of the quantities. Melt the crystallized carbolic acid in the stock bottle by setting this in water warmed to about $50^{\circ}\text{C.} = 122^{\circ}\text{F.}$, and weigh the quantity by pouring it carefully into the bottle containing the water, as it sits upon the scale. Then shake the whole together until the carbolic acid is dissolved, and filter the solution through paper. Label it "Solution of Carbolic Acid, five per cent."

Of this solution, about 15 minims in each fluid ounce gives a proportion of one-sixth of one per cent.

For solution of sulphate of morphia, of the strength called "Magendie's Solution:—"

Take of sulphate of morphia, solution of carbolic acid, 5 percent., of each 2 parts, or 2 grammes, or 31 grains; distilled water, a sufficient quantity. Dissolve the sulphate of morphia in about 50 parts, or 50 grammes, or 775 grains of distilled water; add the solution of carbolic acid, filter through paper, and pass distilled water through the filter, until the filtrate weighs 57 parts, or 57

grammes, or 883 grains. Label "Solution of Sulphate of Morphia, Magendie's;" about 3.51 per cent., or 16 grains in the fluid ounce.

The Various Preparations of Koumiss and their Use in Medicine. Dr. V. A. Jagielski. (*Brit. Med. Journ.*, Feb. 21, 1874.) One of the chief dietetic remedies in therapeutics, which comprises in its composition all the nutritive requirements of the body is the milk of animals. Yet, perfect as milk is in all the elements of a facile alimentation, disease has oftentimes so enfeebled the digestive powers, that even it cannot be assimilated in sufficient quantity to maintain healthy life.

Fortunately, however, there is a chemical sensitiveness in milk, which predisposes it to such physical and internal changes as will enable it to accomplish the prompt and perfect nutrition of the organism by overcoming the pathological obstacles. We have an example of this in the koumiss of the Tartars, which is fermenting mare's milk. It was introduced into medicine by Dr. Stahlberg.

The milk of all animals is convertible into koumiss by one and the same method; but, as the several milks differ among themselves in the quantitative relation of their components, so also will there be corresponding variations in the koumiss, which is produced from them. Qualitatively, however, the koumiss from different kinds of milk may be considered uniform. (*Milk Journ.*, April, 1871.)

The following is a quantitative analysis of a quart bottle of medium or B koumiss, which holds about 12,000 grains of koumiss, obtained from cow's milk. (It was examined when twelve days old; and of spec. grav. 10.28 at 62° F.)

Water	10.662 grains.
Alcohol	192 "
Casein and Albumen.	128 "
Lactose	582 "
Lactic Acid	130 "
Fat	36 "
Ash	90 "
Carbonic Acid	180 "
	<hr/>
	12.000 "

The 90 grains of ash contain, approximately, 60 grains of phosphate of lime and 30 grains of mixed chlorides of sodium and

potassium. The three gradations of koumiss, designated as Nos. 1, 2, and 3, represent the irrepressible changes which it undergoes in time, while fermentation continues in the bottles. In the process of conversion of the milk into koumiss, the following changes take place. By the interaction which is promoted, casein is set free in a highly attenuated molecular condition. The lactose is partially converted into alcohol, carbonic, and lactic acids; and incidentally a bouquet of fragrant volatile products is generated (according to Morfit), which may perhaps be regarded as adjuvant in the remedial effects of the koumiss. The fermentation, once started, will continue, no matter how cold the temperature, or how closely the koumiss may be corked in bottles. Thus, the products arise in time from the minimum in No. 1 to the maximum in No. 3. In passing through these gradations, the koumiss retains all its general properties, but changes some of its specific adaptations, as will be explained directly. In all cases the koumiss is a milk-like fluid. In its fresh No. 1 state, it is a still liquor, and has an agreeable, sweetly acidulous taste, recalling sweet almonds. As it approaches the No. 2 gradation, it becomes more acidulous, assumes a sparkling character, and requires to be drawn from the bottle through a special tap. In No. 3, the sweet taste is replaced wholly by the acidulous, which also has sometimes a slight shade of bitterness; and the koumiss not only sparkles, but rushes through the tap in a rich creamy foam. These changes progress so rapidly in warm weather, that the bottles should be kept in a cold cellar, and treated with the same care as champagne wine. The distinctive character of koumiss is that of being the most assimilable of nutriments. Every quart bottle contains approximately 970 grains of solid respiratory and plastic food, according to Wanklyn, and each of its elements is in a state to promote digestion of the other, by the feeblest stomach.

The author prefers cow's milk to that of mare's for the manufacture of koumiss, because it is not so thin, and gives a koumiss free from every disagreeable odour and taste. Moreover, cow's milk, by its composition, affords facility for varying the composition and consistence of the koumiss product according to the indications of particular cases. This is an important consideration, as through its means the chemist is enabled by his proper skill, to make full koumiss, pure whey koumiss, medium koumiss, and extra kinds for special diseases, like diabetic koumiss, etc.

The physiological features of the several constituents of koumiss may shortly be specified as follows.

The *lactic acid* augments the digestive powers, diminishes the

temperature and the frequency of the pulse, and regulates the mucous secretion. It has an additional specific action in certain diseases, as, for instance, in diabetes.

The *casein*, *albumen*, and *fat*, restore the plastic and heat-giving materials of the body, and act as a chemical inspiration, so to speak, to promote assimilation of its associate constituents.

The *lactose* increases the weight of the body, and gives heat.

The *alcohol* produces sleep, diminishes heat, and forms fat.

The *carbonic acid* allays nausea, calms gastric irritation, augments diuresis, increases the energy of the heart's impulse, and diminishes the frequency of the heart's contractions.

If will thus be seen that the process of double fermentation in the artificial preparation of cow's koumiss has done nearly all the preliminary work which would fall otherwise on the digestive organs. There is no other derivative of milk or any other substance which can be substituted for it with corresponding advantages. The author, after quoting many cases in which koumiss has been used in the treatment of different ailments, gives the following description of various kinds of koumiss.

Full Koumiss (A) is made from cow's milk, preserving the whole of the cheesy matter and as much of the butter or cream as is compatible with digestion and manufacture. It is adapted for cases of great emaciation, with weakness of the digestive organs, when little liquid and no solid food can be taken; also for all complaints which are not of a febrile character, the bodily temperature especially not exceeding 100° Fahr.; and for patients who have previously improved under the use of *Medium Koumiss* (B). This is the artificial representant, as nearly as possible, of the mare's milk koumiss, not obtainable in this country; and can be made by mixing ass's milk with cow's milk in the proper proportions, or by adjusting the natural components of cow's milk alone, so as to diminish the casein and butter, and augment the lactose and salts, thus making the koumiss more facile of digestion. It is suited to delicate or sensitive stomachs, which revolt against the buttermilk taste of the full or A koumiss, in which the cheesy matter proves too rich; and it has a more agreeable taste, so as even to satisfy a very capricious palate. Should there be in some exceptional cases a dislike even to the B koumiss, then the author would prescribe, especially for children or ladies, whey or *C Koumiss*, No. 2 or 3, mixed with one-third part of fresh milk, warmed, if wanted, at the time of drinking, to be taken at first in small doses frequently during the day (one pint bottle *per diem*), increasing every two

days *usque ad libitum* (three or four pints and more per day). Some persons, again, will prefer a little sugar dissolved in a table-spoonful of warm water put first into the tumbler, then the fresh milk, and on this let the koumiss out with all its force to mix thoroughly. A small quantity of champagne wine with it will augment the alcohol in a very pleasant way, if necessary.

The specific gravity of B koumiss varies between 1035 and 1070 in its fresh state, though, by the process of fermentation, it may sink below 1028 in consequence of the lactose breaking up into lactic and carbonic acids and alcohol. It may be used for diseases of the stomach and lungs instead of solid food, especially when the patient frequently asks for an acidulous drink, which in this case will not raise the temperature or irritate the stomach by a too sudden ingestion of solid matter. In this koumiss it is also found that, in the second stage of fermentation, the cheesy matter appears in separate layers, which, however, by shaking, can be easily reduced to a homogeneous milky fluid by combining with the serous layers, and the molecular condition is then so uniform that no flakes are noticeable, as in the genuine or mare's milk koumiss.

The two following analyses, one of mare's milk koumiss, made by Hartier, a chemist of Moscow, and the other of E. Chapman's medium cow's koumiss in London, made by Wanklyn, may be compared.

	Mare's Koumiss.	Medium Cow's Koumiss.
Alcohol	1·65 per cent.	1·60 per cent.
Fat	2·05 "	0·30 "
Milk Sugar . . .	2·20 "	4·85 "
Lactic Acid . . .	1·15 "	1·08 "
Casein and Albumen.	1·12 "	1·07 "
Ashes or Salts . .	0·28 "	0·75 "
Carbonic Acid . .	0·785 "	1·50 "

Thus we see that the casein in both kinds of koumiss is the same to a fraction, but that the butter is much less in the medium koumiss, for the simple reason that it is not advisable to send out the koumiss *à longue course* with all the fat contained in the milk, as it decomposes too quickly into butyric acid, which is deleterious to the digestive organs. Further, the lactic acid and alcohol show no difference worth considering; but the lactose in the medium koumiss is twice as much as in mare's koumiss, if Hartier's analysis deserves full credit for correctness, as Wanklyn's does.

The *Whey Koumiss* (C) is derived from cow's milk completely

freed from its butter and casein, so that it merely contains some albumen, lactose, lactic acid, alcohol, and the salts. It may prove useful as a beverage in disease with even a strong febrile reaction, with copious or excessive expectoration, perspiration, or diarrhoea, either in plethoric or in strong constitutions, which do not require an increase in weight, or in patients with inflammation or fever. The whey koumiss greatly promotes the appetite and digestion, and as a cooling and refreshing dietetic remedy, it allays irritation.

The *Diabetic Koumiss* (D) contains, according to Wanklyn's analysis, 1.6 per cent. of alcohol, 1.1 per cent. of lactic acid, and not more than 1.0 per cent. of lactose. According to Stahlberg, it is of greater value in the treatment of diabetes than even Vichy or Carlsbad water; and the diet need not be restricted in the usual severe way. Its curative effects are superior also to the skimmed-milk treatment, the butter-milk cure, and the lactic acid treatment, all of which have given very good results.

From his experience in the use of koumiss, the author asserts its striking remedial powers in chronic gastro-catarrh, in chronic pulmonary consumption, and in functional debility of the brain. In chronic pharyngitis, laryngitis, bronchitis, No. 2 or No. 3 koumiss will be found to act beneficially; but in ulceration No. 1 or fresh No. 2 is advisable. These preparations are also of great value in diseases of the mucous membranes of the urinary system, as in renal colic, hæmaturia, catarrh of the bladder, and in vaginal and urethral discharges. When the koumiss is taken only in small quantities, the appetite is always keen, but greater quantities are more satisfying, and preclude the necessity of solid food. A patient on two quart bottles a day, appropriates so much nourishing matter that his increase in flesh and weight becomes very perceptible. Instances are recorded in which this increase amounted to 18 oz. per day during the first ten days of the course. The digestive organs are roused into activity, fat is deposited in the subcutaneous cellular tissue, the flesh becomes plump, and the complexion assumes freshness in colour. The respiration acquires more depth and regularity. Large doses have the effect of promoting a feeling of laziness and even sleep, but this sleep is of a most refreshing kind.

These hints may suffice to show that koumiss is neither a specific or a panacea, although rationally or logically, and practically or empirically, its use is a very extended and general one.

5 vols. oil mixed with 1 vol. potash lye of 1-34 and strongly agitated. The mass is—	Snow white. Oil of almonds, very good rapeseed oil, bleached olive oil.	Yellowish. Poppy-seed oil, olive oil, rapeseed oil, sesame oil.	Greenish. Linseed oil, oils containing Cu, and artificial dyes.	Pink colour. Refined rapeseed oil.	Brown and stiff. Hempseed oil.	Yellowish brown and fluid. Linseed oil.	Red. Train oil.
Mix in a beaker carefully equal vol. of oil and red fuming nitric acid. A middle zone forms on point of contact. This is—	Narrow and light green; oil becomes flocculent and opaque. Oil of almonds.	Dark green; pink above. Poppy-seed oil.	Broad and beautiful light blue-green. Olive oil.	Brown-red. Cod-liver oil.	Green, red above. Linseed oil.	Brown-red, greenish below. Rape-seed oil.	The oil colours throughout red, after some time. Linseed oil.
Mix in a beaker the oil with concentrated sulphuric acid. Layers where oil and water meet are coloured—	Beautiful green, with brown stripes. Rape-seed oil.	Yellow; after agitating, brown and olive-green. Poppy-seed oil, linseed oil.	Red, soon changing to black stripes undulating through the liquid. Train oil.	When agitated, fine dark green. Rape-seed oil.	Green. Linseed oil, hempseed oil.	Red. Train oil.	With 20 times its vol. CS ₂ , splendid violet, quickly changing to brown coloration. Train oil.
In the elaidine test the oil mass is—	Solidified, crumbling, and white. Olive oil, oil of almonds, bleached rapeseed oil.	Solidified, crumbling, and yellowish. Rape-seed oil.	Solidified and red. Sesame oil.	Waxlike. Castor oil.	The elaidine mass shows oil drops and stripes. Oil mixtures containing drying oils.	Unchanged. Linseed oil, poppy-seed oil, nut oil.	Ethereal oils, added to the olive to correct the smell, float on the elaidine.
In boiling with water and oxide of lead a plaster is formed, the consistence of which is—	Solid. Olive oil.	Sneary. Rape-seed oil, oil of almonds, sesame oil.	Sneary, but drying after some time. Drying oils.	1 : 40 Linseed oil.	1 : 60 Oil of almonds.	0-950-0-970 Castor oil.	0-930 Linseed oil.
Solubility of 1 part oil in alcohol :	1 : 1 Castor oil.	1 : 25 Poppy-seed oil.	1 : 30 Hemp-seed oil.	0-923 Sesame oil.	0-924 Sunflower oil.	0-950-0-970 Castor oil.	—5° Sesame oil.
Specific gravity of oils is—	0-913 Poppy-seed oil and oil of brass, nap.	0-914 Oil of almonds, oil of brass, camp.	0-918 Olive oil.	—16° Sunflower oil.	—6° Oil of brass, napus.	—40° Oil of brass, camp.	—5° Sesame oil.
No. of degrees Celsius at which the oils change from solid to liquid state :	—27° Hemp-seed oil.	—18° Castor oil. +26° +6 to 8° Olive oil, lard oil.	—16° to —20° Linseed oil. —20 to —25° Oil of almonds.	—16° Sunflower oil.	—6° Oil of brass, napus.	—40° Oil of brass, camp.	—5° Sesame oil.

Detection of Water in Essential Oils. G. Leuchs. (*Zeitschr. für analyt. Chem.*, 1873, 118.) The author points out that the clear appearance of essential oils is no proof of their absolute freedom from water. Small quantities of the latter may however be detected by shaking the oil with two or three volumes of petroleum ether, when, owing to the separation of the water, the mixture becomes turbid.

In this manner water was detected in the oils of lavender, cloves, cinnamon, rosemary, sassafras, juniper, bergamot, and gaultheria.

The oils of turpentine, lemon, amber, and rue were found free from water.

Adulteration of Gum Arabic with Dextrine. Dr. H. Hager. (*Pharmaceut. Centralhalle*, 1873, 202.) Gum arabic in small tears is not unfrequently adulterated with grains of dextrine, as the latter resemble it so much as to be almost indistinguishable from it. A solution of such an adulterated gum, when heated with an alkaline copper solution to 80° C., throws down a copious precipitate of cuprous oxide. If the suspected gum be placed in a glass dish with a flat bottom, then covered with a mixture of equal volumes of strong solution of ferric chloride (sp. gr. 1.48) and water, and stirred for a few seconds so as to moisten it uniformly with the liquid, it will be found that, after half a minute's to one minute's standing, the tears of gum arabic adhere firmly to the bottom of the vessel, whereas the particles of dextrine move about with the liquid as soon as the vessel is quickly inclined to one side. If the mixture be allowed to stand for more than a minute, a few particles of the dextrine may also adhere to the vessel.

The Extinction of Mercury by Fats, and the Preparation of Mercurial Ointments. Magnes Lahens. (*Journ. de Pharm. et de Chim.*, 4th series, xvii., 220.) The fact that the extinguishing action of fatty substances on the globules of mercury varies with different kinds of fat, has been generally attributed to variations in their chemical composition. The author, however, is of opinion that the consistence of the fat has a greater influence than its chemical nature; and he draws this conclusion from the following observations.

Those fats which are liquid at an ordinary temperature when applied in small quantities, take up the mercury in a very short time, forming with it a perfectly homogeneous paste, which remains so on standing.

Those fats which are solid at an ordinary temperature, when applied in the same quantity, take up the mercury slowly and diffi-

cultly; but if they be previously liquefied by heat, the result is almost as favourable as with the liquid fats. The mixture, however, does not keep, as upon cooling the mercury partially separates in globules.

Thus it appears that the proper extinction of mercury depends upon the presence of a thin covering of fat which keeps apart the minute globules of the metal, and that the final success or failure of the operation depends upon the property of this covering of either retaining or not retaining its coherence. The extinction of the metal is therefore the result of a purely mechanical and in no way of a chemical action.

On account of the more rapid action of liquid fats, the French Codex requires the lard to be kept in a semiliquid condition during its trituration with the mercury; but this process proceeds very slowly, and would yield too soft an ointment were it not for the addition of wax. The author strongly recommends the application of oil of almonds in the following proportions:—

R	Mercury	1000 grams.
	Oil of Almonds	20 "
	Lard	980 "

The mercury is first triturated with the oil for about fifteen minutes, after which its globules are no longer discernible by the naked eye; 200 grams of the melted lard are now added, and the trituration continued to the complete extinction of the metal, which is generally accomplished within an hour. The ointment is then mixed with the remainder of the lard. In place of the benzoated lard as prescribed in the French Codex, he recommends a mixture of lard and balsam of Peru, and suggests the following formula:—

R	Mercury	1000½ grams.
	Oil of Almonds	20 "
	Balsam of Peru	20 "
	Lard	960 "

The mercury disappears surprisingly soon in the mixture of oil and balsam. A proper union of the three substances being effected, proceed as above.

Notes on Pancreatin. R. V. Mattison. (*Amer. Journ. Pharm.*, 3rd series, xii., 531.) The increasing popularity of pharmaceutical preparations of this valuable substance induces the author to offer to the profession a few notes on the subject, hoping they may be of service in the elimination and proper exhibition of it in a medicinal form, which will be pleasant and agreeable both to the sight and palate.

The *pancreas* is situated within the curve formed by the duodenum, and opens into the intestine by a duct common to itself and the liver. In its anatomy it closely resembles the salivary glands, and the fluid elaborated by it, called *pancreatic fluid*, appears almost identical with ptyalin. Like this secretion, pancreatic fluid, when pure, is a colourless, transparent, and slightly viscid liquid, alkaline when fresh, quickly, however, on standing, becoming first neutral and then acid, differing, however, from saliva in containing no sulphocyanogen. It resembles albumen in being nearly wholly coagulated by heat, and also by the mineral acids, especially when concentrated; precipitated also by alcohol. When this precipitated coagulum is separated from the liquid, and water added to it, it is soluble, thus essentially differing from albumen.

Its specific gravity is from about 1.008 to 1.009, and it contains from 13 to 19 per cent. of solid matter, of which, according to Schmidt, about $12\frac{1}{2}$ per cent. is pancreatin.

The action of this peculiar principle upon starch is to change it to glucose, and upon fatty and oily substances to quickly emulsify them, thus rendering them easily absorbed and assimilated by the lacteals.

Bernard supposed the fat to be decomposed, and Fownes also states that the fat is resolved into fatty acid and glycerin. This is denied by most recent writers, and such is certainly not its principal action, no saponification apparently taking place, which fact may be easily proven by thoroughly mixing, with agitation, a solution of pancreatin with cod-liver oil. After emulsification, which almost immediately occurs, the oil may be separated by simply agitating the emulsion with ether or petroleum benzin.

This *emulsification* is the *essential* purpose of the pancreatic fluid, thus breaking up the fatty globules, and allowing assimilation to proceed with rapidity, and in this respect is greatly superior to either saliva or albumen. Liquid fats are insoluble in the aqueous albumino-saline fluid, with which the vascular tissues are saturated; consequently no absorption can take place, and the oil passes from the patient in the same state in which it is administered. This occurs most frequently during the administration of cod-liver oil to phthical patients, and the association of this oil with pancreatin offers a valuable and natural method of administration.

At the time when the subject was brought to the writer's notice, he was largely engaged in the manufacture of saccharated pepsin by the process of Mr. E. Scheffer (an excellent one, by the way), and the idea suggested itself that perhaps a solution of sodium chloride

would precipitate pancreatin in the same manner as it does pepsin. After some preliminary experiments, the following was adopted as furnishing the best result:—

The pancreas are dissected and macerated in water acidulated with hydrochloric acid for about forty-eight hours, then separated, and the acidulated solution of pancreatin passed through a pulp filter until it is perfectly clear. To this clear solution is then added a saturated solution of chloride of sodium, and allowed to stand until the pancreatin is separated. This is carefully skimmed off, and placed upon a muslin filter and allowed to drain, after which it should be washed with a less concentrated solution of sodium chloride, and then put under the press. When all the salt solution has been removed, and the mass is nearly dry, it is rubbed with a quantity of sugar of milk, and dried thoroughly without heat, after which it is diluted until ten grains emulsify two drachms of cod-liver oil. To this may be given the name of "saccharated pancreatin."

An elixir being suggested for the exhibition of this in an elegant form, the following formula was devised, and will be found very agreeable.

℞	Pancreas	No. vj.
	Acid. Hydrochlor.	fʒiv.
	Glycerin	q. s.
	Aqua	Cong. jss.

Macerate the dissected pancreas for three days in the mixture of water and acid with Oijss. of glycerin added; then separate the liquid, strain, and add fʒijss. oil of orange and a sufficient quantity of glycerin to make the liquid measure Cong. ijss.; this is then filtered until perfectly transparent. The result is a sweet acidulous elixir, one fluid drachm of which will easily emulsify half a fluid ounce of cod-liver oil—a valuable addition to the number of preparations combining efficiency with pharmaceutical elegance.

The saccharated pancreatin alluded to is a fine white and almost tasteless powder, perfectly soluble in six parts of water, and forming a perfect emulsion when mixed with liquid fats and a small quantity of water.

The author suggests the following formula for the proper exhibition of cod-liver oil in combination with pancreatin.

℞	Pancreatin. Sacchar.	ʒi.
	Aquæ	fʒiv.
	Sacchari albi	ʒviij.
	Olei Morrhuæ	Ojss.
	„ Gaultheriæ	gtt. xx.
	„ Amygdal. Amar.	gtt. v. M.

Rub the saccharated pancreatin with the sugar and water, in a mortar, until a thick syrup is formed; to this add the cod-liver oil, in which the essential oils have been dissolved. This forms a perfect emulsion, without difficulty. It separates, of course, upon standing, but can easily be shaken together again, forming an emulsion with slight agitation. This is certainly to be preferred to the thick mucilaginous emulsions made with gum arabic or tragacanth, which are usually so distasteful to patients, because of their being so thick.

By the above formula a preparation can be furnished containing seventy-five (75) per cent. of oil, in the condition in which the oil, as usually prescribed, enters the duodenum, thus rendering its absorption and assimilation by the lacteals comparatively easy, the molecular formation of the oil being completely broken up. To make the emulsion whiter a little lime water may be substituted, omitting an equivalent quantity of water, a partial saponification rendering the emulsion more permanent and more elegant in appearance.

The easy assimilation of this preparation having been experimentally demonstrated by several of our eminent medical practitioners, it stands unrivalled in a therapeutical point of view as a standard pharmaceutical preparation of cod-liver oil.

The action of pancreatin upon albumen having frequently been stated, experiments were instituted in order to more closely examine this action. Accordingly, ten grains of saccharated pancreatin were dissolved in one fluid ounce of water, with the addition of six drops of hydrochloric acid. To this thirty grains of coagulated albumen were added, and the whole kept at a temperature of 100° F., being occasionally agitated. At the end of six hours about twenty-five grains were dissolved, thus showing the correctness of the usually received statement, and at the same time showing its great inferiority to saccharated pepsin, which under similar circumstances would have dissolved from 120 to 180 grains.

The action of pancreatin upon starch was next observed, and a drachm of Bermuda arrowroot was mixed with a solution of ten grains of saccharated pancreatin in one fluid ounce of water, and kept at the temperature of 100° F. for several hours. At the expiration of this time the mixture was filtered and the filtrate tested for glucose, abundant evidence of the presence of this substance being afforded by Trommer's and Fehling's tests. That this glucose was the product of the action of pancreatin upon starch was demonstrated by testing the arrowroot, which gave a negative result, and

by a comparative test with the solution of glucose obtained by the above action of the pancreatin upon the arrowroot. Fifty minims of this solution, containing less than one grain of lactic acid, reduced the cupric solution much more readily than a similar solution containing ten grains of lactic acid, the purity of both specimens of milk-sugar having been ascertained before using.

Although the strength of saccharated pancreatin is given as "ten grains emulsify two fluid drachms of cod-liver oil," yet when ten grains were dissolved in one fluid drachm of water, and one fluid ounce of oil added, perfect emulsification was effected in a very few minutes.

Action of Water upon the Resinoid Principle of Opium. L. Périer. (*Pharm. Journ.*, 3rd series, iv., 218; from *Bulletin des Travaux de la Société de Pharmacie de Bordeaux*, xiii., 245.) Soubeiran, in his *Traité de Pharmacie théorique et pratique*, has pointed out that the proportion of water put into contact with crude opium exercises an influence upon the solution of the resinoid principle, oil, and narcotine, but that the resulting modifications of this action are little known. The author has found that at any rate the proportion of water employed plays an important part in the solution of extract of opium, as shown by the following experiments:—

(1.) 120 grams of extract of opium was divided into two equal parts; one half was treated with 120 grams of distilled water at 15° C., the other half, with 250 grams of water at the same temperature. At the end of six hours, assisted by agitation, solution was complete in both liquids, and they were filtered through paper. The first only left a few bubbles of blackish matter; the second abandoned six grams of oleo-resin.

(2.) The first solution was then evaporated to dryness and the product divided into two parts; one was put into a small quantity of water (about twice its own weight), the other into 1000 grams. After twenty-four hours, the concentrated liquor was quite limpid and without deposit, but the dilute liquor had deposited a considerable residue.

(3.) 30 grams of extract was dissolved in water, under the conditions prescribed in the Codex (ten times its weight of water at 15° C.). The solution was at first muddy, a black granular precipitate covered the bottom of the vessel; but upon evaporation in a water-bath the extract again became homogeneous, and afterwards dissolved in 30 grams without any deposit. In its turn, this solution threw down a precipitate when double its own volume (60 grams) of water was added, and the precipitate was augmented

commensurately with the addition of more water. Afterwards, concentration reproduced a normal extract, soluble without residue.

(4.) The quantity of water employed gave rise to a regular progression in the phenomena of solution and precipitation. If, for example, five grams of extract of opium were put into ten grams of distilled water, the portion which was first dissolved left in suspension a granular deposit. In proportion as the liquid became saturated this deposit was effaced, until at last no more remained undissolved. The maroon black liquid, a layer of four centimetres of which was impermeable by sunlight, did not require filtering; if it were sometimes scarcely clear yet it did not deposit. With five grams more water a turbidity was manifested which was not completely removed by shaking. At the maximum of 20 grams of water the deposit commenced; towards 30 grams, and after standing for an hour, the deposit was nearly doubled; at 50 grams (ten times the weight of the extract) it ceased, and the liquid was no longer troubled by fresh additions of water.

The whole of the resin however could not be removed by water from solutions of opium. Thirty grams of extract which no longer gave a precipitate upon the addition of water, yielded 2.5 grams of black resin when treated with ammonia. Although in this case the extract was the product of a fourth maceration, the phenomenon occurred, but in a less degree, under ordinary conditions.

It thus appears that the same matter will alternately pass through a filter without residue or leave an enormous residue, according as the quantity of water employed is small or large; also that the precipitation ceases when the weight of the menstruum is about ten times greater than that of the substance. It is even possible to dissolve in a very concentrated cold solution a deposit that has not been obtained from it. Finally, that the heat of a water-bath will restore the homogeneity destroyed by an excess of water, an observation that is not in accord with what has been written by other authors. The constant results obtained during his experiments have induced M. Périér to formulate his conclusions as follows:—

(1.) The quantity of distilled water at 15° C. in which extract of opium is dissolved has a direct and certain influence upon the partial elimination of the resinoid matter.

(2.) Concentrated aqueous infusions of extract of opium do not give any notable precipitate, except with the lapse of time; dilute solutions, where the weight of the menstruum exceeds twice that of

the matter dissolved give as much more residue as the proportion of water is increased from two to ten.

(3.) Water, in whatever quantity, does not precipitate the whole of the resinoid matter; a certain portion yields only to ammonia.

(4.) The residue of extract of opium treated with cold water redissolves in the concentrated mother solution, and heat, instead of aiding in the separation of the resin, oil, and narcotine, reconstitutes the homogeneity of the extract.

The Detection of Oil of Turpentine in Essential Oils by Means of Spirits of Wine. G. Draggendorff. (*Archiv der Pharm.*, Sept., 1873, 268; from *Repert. für Pharm.*, xxii., vol. i.) The author gives a detailed account of his experiments on the detection of oil of turpentine as an adulterant in essential oils. He operated with alcohols of various strengths (expressed in per cent. by volume) which he added from a burette to measured quantities of the oils, until the mixtures became clear after shaking. The end of each experiment could be recognized with great precision, as the ultimate change from a distinct turbidity to perfect clearness was in most cases decided by 0.1, and even by 0.05 c.c. of the spirit. The observations were made at 14–20°C. Oil of turpentine being perfectly soluble in alcohol of 96 per cent. in any proportion, but not so in alcohol of 90 per cent. and less, it is obvious that this mode of testing could only give satisfactory results in the case of those essential oils which are readily soluble in alcohols of 75–90 per cent.

The doubtful results obtained with fir-wood oil show that an admixture with common oil of turpentine cannot be detected by the spirit test.

Oil of Juniper Berries belongs to those oils which form a clear mixture with a small quantity of strong alcohol, but a cloudy one with a larger amount. The fresh oil forms a clear solution with alcohol of 95–100 per cent. in any proportion; 3 volumes of alcohol of 93 per cent., dissolve 1 volume, and $4\frac{1}{2}$ volumes of 91 per cent. dissolve 1 volume of oil. Mixtures of this oil and oil of turpentine show the same behaviour as the pure oil, so that such an admixture cannot be detected.

Oil of Juniper Wood resembles the oil from the berries, but requires a still larger quantity of strong alcohol to render the mixture turbid. 1 c.c. of this oil forms a clear mixture with 0.1 c.c. of alcohol of 90 per cent. or more, but a cloudy one with the same quantity of alcohol of 89 per cent.

Oil of Savin is soluble in strong alcohol in all proportions. 1 c.c. of a mixture of 9 parts of the fresh oil and 1 part of oil of tur-

pentine required the addition of 3 c.c. of alcohol of 80 per cent. to form a clear mixture. An adulteration of this oil with but 10 per cent. of oil of juniper berries could also be readily detected, as 1 c.c. of such a mixture did not produce a clear mixture with even 5 c.c. of alcohol. Oil of savin which has become partially resinified by keeping is even more soluble in alcohol than the fresh oil.

Oil of Copaiba resembles the oil of juniper berries in its behaviour to alcohol. When kept for a long time it forms a clear solution with a small quantity of absolute alcohol, but this becomes turbid on the further addition of the solvent, which is not the case with the fresh oil. 1 c.c. of the latter is soluble in 4.2–4.7 c.c. of alcohol of 96 per cent.

Oil of Eucalyptus forms a clear mixture with $\frac{1}{10}$ of its volume of absolute alcohol, but a cloudy one with a larger quantity. If alcohol of 89 per cent. be used, a single drop will render 1 c.c. of the oil turbid.

Oil of Lemon requires alcohol of at least 98 per cent. to form clear solutions in all proportions; and its adulteration with oil of turpentine cannot be readily detected by the spirit test.

Oil of Bergamot is most frequently adulterated with oil of copaiba and with the cheaper oils of *Aurantiaceæ*, which may both be detected by the spirit test. 1 c.c. of the pure oil is soluble in 1.15 c.c. of spirit of 78 per cent. A mixture with $\frac{1}{10}$ of its volume of oil of copaiba would not form a clear solution with even 10 volumes of spirit of 78 per cent.; nor will the addition of 5 c.c. of spirit of the same strength to 1 c.c. of the oil produce a clear mixture if the latter contain 10 per cent. of *oleum aurantii*. A mixture of oil of bergamot with 10 per cent. of oil of lemon would require more than 3.3 volumes of spirit of 88 per cent. to yield a clear mixture.

Oil of Caraway is often found to contain turpentine. 1 c.c. of the pure oil requires but 0.8 c.c. of spirit of 84 per cent. to form a perfect solution, and is soluble in spirit of 88 per cent. in all proportions. An adulterated oil, containing 10 per cent. of oil of turpentine, requires 9.5 c.c. of spirit of 86 per cent. to effect solution.

Pure *Oil of Peppermint* is soluble in spirit of 70 per cent. in the proportion of 1 volume to 2.2 volumes of the solvent. But an oil which is adulterated with 10 per cent. of oil of turpentine does not give a clear solution with less than 10 volumes of such spirit.

Oil of Spearmint, if pure, is soluble in 2.7 volumes of spirit of 65 per cent., and forms a clear mixture with spirit of 86 per cent. in all proportions. If it contain 10 per cent. of oil of turpentine, it will require 4.25 volumes of spirit of 65 per cent. to produce a clear

mixture. The oils of spearmint and lavender do not take up more than 10 per cent. of the adulterant (turpentine) without becoming turbid.

Oil of Lavender is even more soluble in spirit of 65 per cent. than the preceding oil (1 in 2·3); but 5 volumes of the spirit will not suffice to form a clear mixture if the oil contain 10 per cent. of either oil of turpentine or oil of copaiba.

Oil of Cajuput forms a clear solution with 2·5 volumes of spirit of 68 per cent., and with any proportion of alcohol of more than 90 per cent.; but if adulterated with 10 per cent. of oil of turpentine, it does not form a clear mixture with as much as 10 volumes of spirit of 65 per cent.

Oil of Sage, if pure, requires 3·1 volumes of spirit of 65 per cent. to form a clear solution; but if adulterated with 10 per cent. of oil of turpentine or oil of copaiba, it requires more than 10 volumes.

Oil of Cloves is soluble in 2·7 volumes of spirit of 65 per cent., but in the presence of 10 per cent. of the adulterant, the mixture with 10 volumes would still be turbid.

Oil of Cinnamon and *Oil of Cassia* are tested for oil of copaiba or turpentine in the same manner as the three preceding oils; if pure, they are both soluble in 3 volumes of spirit of 65 per cent.

Thus the author's experiments show that the spirit test gives reliable results with the oils of *bergamot*, *caraway*, *peppermint*, *spearmint*, *lavender*, *cajuput*, *sage*, *cloves*, *cinnamon*, and *cassia*.

Ammonio-Citrate of Iron. Charles Umney. (*Pharm. Journ.*, 3rd series, iv., 469.) The variation in appearance of ammonio-citrate of iron, as met with in trade, must have been noticed by every observant pharmacist.

Since the time of its introduction into medicine by Beral, now about thirty years since, most manufacturers have adopted, notwithstanding the various officinal formulæ that have been published, one or other of the following methods for its production:—

- (a) By dissolving metallic iron (nails) in a solution of citric acid by the aid of heat to the complete saturation of the acid.
- (β) By adding hydrated ferric oxide to citric acid dissolved in about twice its weight of water, assisting its solution by the heat of a water-bath until the oxide is no longer dissolved, and is visibly in excess.

Solution of ammonia in both cases being added after filtration, to produce the double salt. By either method the result is very similar, the amount of anhydrous ferric oxide resulting from a calcination of the salt with free exposure to air being from 30 to 31

per cent., and the appearance of the scaled product nearly or quite identical.

A review of the various formulæ that have been published in the London and British Pharmacopœias will serve, not only to show the relative amounts of ferric oxide directed to be added to the citric acid, but also to indicate (when the examination of commercial specimens is brought forward) that obsolete processes are followed by manufacturers.

As this iron salt is almost universally used, it will be interesting at the same time to note the formulæ of the French Codex and the United States' and German Pharmacopœias.

London Pharmacopœia, 1851. (First official.)

Sulphate of Iron	12 ozs. (Troy).
Carbonate of Soda	12½ ozs.
Citric Acid	6 ozs.
Solution Ammonia ('960)	9 fl. ozs.

British Pharmacopœia, 1864.

Solution of Persulphate of Iron (1·441)	8 fl. ozs.
Citric Acid	5 ozs. (Avoir).
Sol. Ammonia ('960)	14 fl. ozs.

British Pharmacopœia, 1867.

Solution of Persulphate of Iron (1·441)	8 fl. ozs.
Citric Acid	4 ozs. (Avoir).
Sol. Ammonia ('959)	19½ fl. ozs.

United States' Pharmacopœia, 1873.

Citric Acid	5 ozs. 360 grains (Troy).
Sol. Persulphate of Iron (1·320)	16 fl. ozs.
Sol. Ammonia ('960)	20 fl. ozs.

French Codex, 1866.

Acid Citric	100 parts.
Hydrated Peroxide of Iron	q. s.
Sol. Ammonia	18 parts.

Add such a quantity of hydrated ferric oxide as will correspond to 53 parts of anhydrous oxide of iron.

Pharmacopœia Germanica, 1872.

Citric Acid	2 parts.
Oxide of Iron	q. s.
Then add Citric Acid	1 part.
Sol. Ammon.	q. s. to saturation.

The following table, deduced from these formulæ, will show at a glance the relative amounts of anhydrous ferric oxide to the same amount of citric acid :—

	Citric Acid.	Ferric Oxide.	
Lond. Pharm., 1851	100 parts	57·3	Added as ferrous salt.
British „ 1864	„	33·4	Added as ferric salt.
„ „ 1871	„	41·8	„
U.S. „ 1873	„	40·0	„
French Codex . .	„	53·0	„
Pharm. Ger., 1872	„	?	„

The London and British Pharmacopœias describe the amount of ferric oxide resulting from incineration with free exposure to air, but the Codex and German and American Pharmacopœias do not state the amount of ferric oxide perfect specimens of their respective salts should contain.

Pharm. Lond. . 1851 . .	34	per cent. Fe_2O_3 .
Brit. Pharm. . 1864 . .	26·5	„
„ „ . 1867 . .	27·0	„
U.S. „ . 1873 . .	?	„
French Codex	?	„
Pharm. German. 1872 . .	?	„

Most of the recent formulæ have one feature in common, viz., the complete saturation of the acid by the oxide of iron, but the quantities ordered by each work with this object in view are very disproportionate.

The British Pharmacopœia, 1867, says, “*dissolve the citric acid in eight ounces of distilled water, and having applied the heat of a water-bath, add the oxide of iron, and stir them together until the whole, or nearly the whole, of the oxide has dissolved.*”

It is presumed that complete saturation is intended by the expression, “*until nearly the whole of the oxide has dissolved,*” and that the amount of oxide produced by the precipitation of the persulphate of iron ordered is in slight excess of the quantity required for such saturation.

Be this as it may, upon referring to the Codex we find an amount of hydrated oxide ordered which shall be equal to 53 parts of anhydrous oxide, whereas the British Pharmacopœia, 1867, orders an equivalent of 42 parts only.

Practically I have found that the French Codex formula is much more like the basis of ammonio-citrate of iron of the best makers

than is the British Pharm. formula, although fifty parts (half its weight) would more accurately represent the amount of ferric oxide (added as hydrated oxide) required to saturate 100 parts of citric acid than would *fifty-three* parts, as named by the Codex.

A comparison of the formulæ of the British Pharmacopœias of 1864 and 1867, as to the amount of ferric oxide added to the acid, and the amount stated to be left by calcination, is most conflicting; for instance, the 1864 Pharmacopœia shows that for 33·4 parts ferric oxide to 100 citric acid, as much as 26·5 per cent. is left upon calcination, whereas that of 1867 indicates that from 41·8 parts added to the same amount of citric acid, 27 per cent. is left by calcination.

The mean of three analyses of ammonio-citrate of iron (B.P. 1867) gave ferric oxide by calcination 27·4 per cent., proving the accuracy of the present officinal test and the fallacy of the 1864 Pharmacopœia.

Of course it may so happen that the British Pharmacopœia does not intend that the acid should be saturated with oxide, and has merely framed the formula with other objects in view.

If it were so contemplated, I think a great improvement in the formula would have been made if a salt had been recognized that would have scaled easily and represented the best specimens as met with in trade.

An examination of the ammonio-citrate of the leading London manufacturers indicates that at the present time uniformity is the exception rather than the rule; that the British Pharmacopœia scales are not to be met with; that the preparation of the London Pharmacopœia, or a modification of it, is still used; and that the *complete saturation* process is in some cases followed.

<i>London Pharmacopœia</i> , 1857 .	34·0 (determined).
<i>British Pharmacopœia</i> , 1867 .	27·4 ,,
<i>Manufacturing Process</i> (saturation)	30·7 ,,
Trade Specimens (1) . .	26·0
(2) . .	24·1
(3) . .	30·1
(4) . .	30·0
(5) . .	33·4
(6) . .	33·3
(7) . .	29·4

As uniformity in all substances used in medicine is of vital importance, I would suggest that at the earliest convenient date the use of ferric oxide sufficient to the complete saturation of the acid by the aid of a water-bath heat be recognized, and that the formula

of the British Pharmacopœia be amended by substituting *nine and a half fluid ounces* of the persulphate of iron solution for the present quantity of eight fluid ounces, or as much hydrated ferric oxide to one hundred parts of citric acid as shall be equivalent to fifty parts (49·6) of anhydrous ferric oxide.

Adulteration of Liquid Storax with Turpentine. H. Hager. (*Pharm. Centralhalle*, xv., 163.) The author states that the turpentine of various species of *Pinus* and *Abies* occur as adulterants in liquid storax, and may be detected therein in the following manner. The storax is melted in a test-tube placed in a water-bath, and shaken with half its volume of absolute alcohol to effect solution; this is then agitated with several times its volume of petroleum benzin, and the operation repeated twice. The decanted benzin solutions are united and evaporated in a water-bath, from a tared vessel. The residue should weigh 45–55 per cent. of the storax; it should be colourless, with a bluish opalescence, and of an agreeable odour. If turpentine be present, the residue will be yellowish, of the odour of the turpentine, and larger in weight.

The Detection of Aloes and other Bitter Drugs. O. Bach. (*Amer. Journ. of Pharm.*; from *Journ. für praktische Chem.*, 1874, 188.) The author has made a series of experiments with the object of studying the analytical relations of the bitter principles of aloes, colocynth, wormwood, gentian, agaric, scammony, and jalap resin. The active principles of the first four are soluble in water; of the other, those of agaric and scammony dissolve in ether, jalap resin remaining insoluble in both solvents.

An aqueous solution of aloes forms a voluminous yellow precipitate with acetate of lead, and a powdery greyish white one with mercurous nitrate. The aqueous solution of colocynth gives with mercurous nitrate a flocculent grey precipitate conglomerating on boiling; this, when dissolved in nitric acid and treated with ammonia, yields a golden yellow filtrate, leaving upon evaporation to dryness a residue insoluble in acetic acid, which turns bright red with H_2SO_4 at a moderate heat; and cherry red with Froehde's test (conc. sulphuric acid, 1 c.c.; molybdate of sodium, ·001 gram).

Wormwood forms with water a brown infusion which gives with mercurous nitrate a dirty yellow precipitate, becoming grey on boiling; with subacetate of lead a brown-yellow, and with acetate of barium a brown precipitate; H_2SO_4 colours the infusion brown; Froehde's test at first brown, becoming green, and finally violet. Gentian yields a yellowish opalescent infusion, producing with mercurous nitrate, after some time, a very slight pulverulent pre-

precipitate; with acetate of barium from ammoniacal solution a flocculent precipitate, which yields with H_2SO_4 and HNO_3 a yellow, and with potassa a handsome golden-yellow solution. The resinous portion of agaric is soluble in alcohol and partly in hot water, yielding with the latter an opalescent liquid; also in solution of soda, from which it is reprecipitated by acids. It is insoluble even in warm HNO_3 . Cold H_2SO_4 dissolves it, with an orange colour, becoming brown on heating; nitric acid added to this solution causes decoloration and separates colourless floccules. Scammony dissolves in ether, separating white flocks; it is readily soluble in alcohol, with a greenish-yellow colour; insoluble in solution of sodium carbonate, swelling to a yellow mass in nitric acid, readily soluble in H_2SO_4 , being orange coloured at first, and becoming cherry-red after some time. Jalap resin is insoluble in water and ether, H_2SO_4 gives a brown solution, becoming blood-red after awhile and emitting the peculiar odour of jalap.

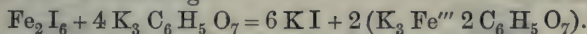
On examining a medicine for any of the above substances, it is, if necessary, evaporated to dryness, extracted with alcohol, and again evaporated. The dry powdered residue is exhausted with cold water, if necessary, concentrated by evaporation in a water-bath, cooled, treated with mercurous nitrate in excess, rapidly filtered, and washed. The precipitate is dissolved in warm diluted nitric acid, when colocynth will be indicated by the yellow colour of the liquid and some insoluble flocks; in the presence of wormwood the flocks are scarcely recognizable, and the liquid is brown. Excess of ammonia precipitates the mercury, but dissolves colocynth and wormwood. The filtrate is evaporated to dryness, and treated with warm acetic acid; wormwood will be dissolved, and colocynth remains behind, the latter giving with H_2SO_4 and with Froehde's reagent the above mentioned colour reactions. The acetic solution, on evaporation, leaves a yellowish brown residue, to be identified by Froehde's test as stated above.

The filtrate from the mercurous precipitate is treated with ammonia, filtered, and acetate of barium added; a precipitate indicates gentian, an orange-red colour of the liquid points to aloes. After evaporation to dryness, the residue is exhausted with alcohol, the liquid evaporated, and the residue treated with warm HNO_3 . The yellowish red solution is evaporated to dryness and dissolved in little water, when it will yield a blood-red solution with potassa and glucose, if aloes be present. The precipitate obtained by acetate of barium, containing the bitter principle of gentian, is exhausted with alcohol, evaporated, and treated with HSO_4 , HNO_3 or HKO , as above.

The residue of the original substance left after treatment with water may contain the resins of agaric, scammony, and jalap; to separate them it is treated with ether, the solution evaporated, and the residue treated with warm solution of sodium carbonate. If scammony be present, a residue will be left, swelling with HNO_3 to a yellow mass, but soluble in H_2SO_4 , with an orange-red colour, becoming blood-red on standing. The soda solution is precipitated with an acid; the resin of agaric is insoluble in HNO_3 , but dissolves in H_2SO_4 , with an orange colour.

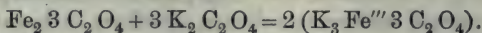
The resin of jalap, remaining behind after treatment with water and ether, is recognized by its behaviour to H_2SO_4 , as given above.

Notes on the Tasteless Iron Combinations. E. Rutter. (*Amer. Journ. Pharm.*, 4th series, iii., 529.) Since the introduction of these salts by Mr. Creuse, of Brooklyn, the author has been much engaged in their preparation, and has endeavoured to ascertain their true composition. The theory of double decomposition falls at once to the ground, as in that case one molecule of ferric salt would require only two molecules of alkaline citrate; whereas it will be found that four molecules of the latter are always required to form the green compound. Now citric acid, as is well known, may, under certain conditions, be resolved into oxalic and acetic acids, and the similarity of colour to that of ferric oxalate led the author to suppose that the reaction might consist in the splitting up of the organic acid and the formation of a double oxalate of potassium and iron, together with chloride, iodide or phosphate of potassium, according to which salt was used. Such, however, is not the case; for on treating the green compound with excess of alkali, filtering out the iron, and adding calcium chloride to the filtrate, a precipitate is formed, which is freely soluble in acetic acid, and cannot therefore be calcium oxalate. This theory set aside, the only tenable one seems to be the following:—



That is, the formation of double citrate of iron and potassium, together with potassium iodide. Believing this to be the true reaction, the author tried the experiment of mixing potassic and ferric citrates in equivalent proportions, and obtained a solution possessing the qualities and general appearance of the so-called tasteless salts. Calculating from the formula, the dried salt should yield 13.913 per cent. of ferric oxide. The author ignited several portions, but, owing to the absence of crystallization and the varying degree of moisture, failed in obtaining exact results. The potassio-ferric oxalate is another of these double salts. It may be obtained

by mixing solutions of ferric oxalate and neutral potassium oxalate in the proportion of one molecule of the former to three of the latter, as follows:—



On evaporating the solution, the salt may be obtained in beautiful green crystals, freely soluble in water, but insoluble in alcohol. It possesses the same quality of tastelessness, without astringency, as the double citrate, and has the advantage of being stable, easily obtainable in crystals, and therefore more definite in composition.

Whether it is expedient to employ a mixture of two different compounds in place of a definite preparation, is a question for the physician to answer; but it seems probable that if he wishes to give iron in combination with chloride, iodide, or pyrophosphate of ammonium, sodium, or potassium, as the case may be, he would prefer to order it so in his prescription. The tendency of late years has been towards the employment of more concentrated remedies in place of the cumbrous formulæ of ancient times.

Tea. I. Alfred Wanklyn. (*Chemical News*, October 10th, 1873.) There is no doubt that tea is sometimes adulterated with iron-filings and other preparations of iron, and when public analysts have found that iron had been put into tea leaves they have doubtless, in some instances, found that which really had taken place.

The ash of genuine tea leaves, however, contains iron, and by no means a small proportion of it. In a paper by Zöller (*Liebig's Annalen*, May, 1871), the percentage of oxide of iron in the ash of tea leaves is given as 4·38 per cent. The importance of this determination depends upon the circumstance of the tea having been received direct from the growers, who were personal friends of Liebig; in that instance, therefore, there could be no question of adulteration. It may be interesting to reproduce Zöller's analysis, which is as follows:—

Potash	39·22
Soda	0·65
Magnesia	6·47
Lime	4·24
Oxide of Iron	4·38
Protoxide of Manganese	1·03
Phosphoric Acid	14·55
Sulphuric Acid	trace
Chlorine	0·81
Silica	4·35
Carbonic acid	24·30

100·00

From this it is abundantly manifest that the mere qualitative detection of oxide of iron in the ash of tea is no valid proof of adulteration; and that in order to make out a case it is necessary to show sensibly more than 4 per cent. of oxide of iron in the ash.

On the present occasion I wish to call the attention of public analysts to the importance of investigating the ash of samples of tea. Zöller found the ash of tea leaves to be 5·63 per cent, using in his investigation tea leaves of guaranteed purity. I find that commercial tea yields a very similar result, as is seen from the following analysis made in my own laboratory:—

	Percentage of Ash.
Specimen of Tea used by myself	9·53
Civil Service Tea	5·56
Horniman's Tea	5·99
Mandarin's Tea, 8s. per lb.	5·30
Orange Pekoe, 5s. per lb.. . . .	5·84
Do. do.	6·60
Green Tea, 4s. 6d. per lb.	5·86
	<hr/>
Average	5·75

These determinations were made on tea in its ordinary air-dried condition, and agree sufficiently with Zöller's. The proportion of ash in absolutely dry tea is 5·92 per cent.

Zöller further calls attention to the composition of the ash of spent tea leaves. This, as might be expected, is far less rich in alkalies, being far less soluble. Zöller's analysis is as follows:—

Potash	7·34
Soda	0·69
Magnesia	11·45
Lime	10·76
Oxide of Iron.	9·53
Protoxide of Manganese	1·97
Chlorine	trace
Phosphoric Acid	25·41
Sulphuric Acid	trace
Silica	7·57
Carbonic Acid	25·28
	<hr/>
	100·00

This ash, as a matter almost of course, must be composed mainly of material insoluble in water.

For practical purposes, that is to say for use by the public analysts, a complete analysis of the ash would be too cumbrous and troublesome. A great deal of information may, however, be gathered

from a tolerably simple operation, viz., from a determination of the relative quantities of soluble and insoluble ash in tea leaves. With the object of rendering a determination of this sort available, I have made such determinations on dried leaves of various kinds. The leaves, with the exception of the tea and Paraguay tea leaves, were gathered by my assistant on the 24th of August this year. The following are the results:—

Percentages on the Dried Leaves. The Ash.			
	Total.	Soluble in Water.	Insoluble in Water.
1. Common Tea .	5.92 .	3.55 .	2.37
2. Paraguay Tea .	6.28 .	4.22 .	2.06
3. Beech .	4.52 .	2.00 .	2.52
4. Bramble .	4.53 .	1.84 .	2.69
5. Raspberry .	7.84 .	1.72 .	6.12
6. Hawthorn .	8.05 .	3.78 .	4.27
7. Willow .	9.34 .	4.16 .	5.18
8. Plum .	9.90 .	5.66 .	4.24
9. Elder .	10.67 .	3.19 .	7.48
10. Gooseberry .	13.50 .	7.83 .	5.67

From this table it will be apparent that the ash of Paraguay tea is the only ash capable of being mistaken for the ash of tea; the total percentage would of itself exclude all the others. The ash of Paraguay tea is, however, distinguished from the ash of common tea by containing a higher proportion of soluble matter.

The ash of beech and of bramble is distinguished from that of tea by being too small in amount, and by containing too little soluble matter. All the rest are exceedingly unlike tea ash.

The determinations of the total, the soluble, and the insoluble ash in leaves are made with great facility. Dried leaves burn up with great ease; and for the purpose of getting a complete combustion there is no occasion for the employment of nitric acid. I am in the habit of employing about 2 grams of the dried leaves for the experiment. These I burn in a small platinum dish, and when the resulting ash has become grey, I allow the dish to cool, and weigh it together with its contents. The ash is then heated to boiling with a little water, and the solution filtered, and the filtrate evaporated to dryness in a small platinum dish; the resulting residue is then ignited, cooled, and weighed. Thus I get determinations of "total ash" and "soluble ash;" the "insoluble ash" is found by difference.

Sand is sometimes found in tea leaves; this is very easy of de-

tection. It will, of course, remain in the insoluble portion of the ash, and refuse to dissolve when that is treated with hydrochloric acid. The portion of real tea-ash which is insoluble in water is almost entirely soluble in hydrochloric acid.

Very many uses may be made of a determination of the ash in a sample of tea. As an example of what may be learnt from such determinations, I will cite an imaginary case, which, however, finds its parallel in practice. Let us suppose that the tea yielded the normal proportion of ash, viz., 5.75 per cent. on the air-dried leaves, and let us suppose that one-third of this consisted of sand. With these data before him the analyst would be justified in finding, not only that there was a little sand in the tea, but that at least one third of the sample did not consist of genuine tea, but either of some other kind of leaf or of spent tea (which is not so rich in ash as genuine tea).

On a future occasion I hope to publish further researches on tea. I will conclude now with an expression of my conviction that a little careful chemical work bestowed on the subject of tea would render the examination of it highly certain and satisfactory.

The Ash and Extract of Tea. G. W. Wigner. (*Pharm. Journ.*, 3rd series, iv., 909.) The author has made analyses of 40 samples of genuine, and 21 samples of adulterated, tea, and offers his result for comparison with those of Mr. Wanklyn and Mr. A. S. Wilson.

Unadulterated Teas—Average of 40 Samples.

	Average.	Highest.	Lowest.
Total Ash	5.68 per cent.	6.31 per cent.	5.20 per cent.
Ash Soluble in Water . . .	3.00 "	3.55 "	2.45 "
" " Acid	2.20 "	2.84 "	1.24 "
Silica	0.48 "	1.68 "	0.08 "
Alkali in Ash, calculated as			
Potash	1.62 "	1.88 "	1.30 "

No. 47 is a remarkable specimen. It contains small stones of an average weight of about .15 grain, fairly uniform in size, mostly wrapped in the leaves, and is very heavily faced. It was taken from the top of a chest as imported. Obviously, this sample and No. 43 consist mainly of exhausted leaves redried and coloured.

No. 56 contained a very large proportion of exhausted leaves.

Nos. 48 to 53 were all most grossly faced; not with the ordinary slight facing, but with as much colour as could be made to adhere.

No. 54 had been wetted and redried.

No. 55 consisted mainly of stalks.

Adulterated or Spurious Teas.

Number.	NAME OF TEA.	Total Ash.	Ash Soluble in Aqua.	Ash Soluble in Hydrochloric Acid.	Silica.	Alkali in Ash, calculated as Potash.
41	Caper	15.42	2.24	3.40	9.78	1.21
42	Ditto	2.13	1.62	5.78	4.73	2.10
43	Ditto	10.11	.76	1.09	8.26	
44	Ditto	17.13	2.43	2.86	1.84	.35
45	Ditto	7.03	3.00	2.64	1.39	
46	Ditto	6.94	2.66	2.61	1.67	1.50
47	Gunpowder (special)	2.94	.47	4.60	37.87	
48	Gunpowder	47.01	2.74	3.38	.89	1.44
49	Ditto	6.53	3.19	2.56	.78	1.57
50	Ditto	8.05	3.08	3.55	1.42	.94
51	Ditto	5.04	3.00	1.81	.23	1.54
52	Ditto	6.66	2.80	2.99	.87	1.00
53	Hyson	7.87	2.11	4.16	1.56	.90
54	Congou	5.62	2.27	2.59	.76	1.46
55	Ditto	6.27	2.48	2.90	.89	
56	Ditto	6.33	1.57	3.51	1.30	1.62
57	Ditto	6.01	2.32	2.56	1.13	1.45
58	Ditto	5.72	2.49	2.56	.67	
59	Spent leaves	3.34	.41	2.37	.50	.43
60	Ditto	3.53	.80	2.60	.13	.89
61	Mixture of 40 per cent. Exhausted Leaves No. 60, with 60 per cent. Mixed Black Tea	4.64	1.98	2.50	.16	1.15
	21 Samples Average	8.78	2.12	3.00	3.66	9.30

Nos. 57 and 58 contained excessive proportions of stalks.

Nearly all these samples contained leaves which were not tea leaves. Nos. 59 and 60 are ordinary samples of exhausted tea leaves from my own use.

No. 61 is an artificial mixture of exhausted leaves with good mixed tea, to show the effect on the ash.

The averages of this series are of course of very little value, owing to the various classes included in it.

Some of these samples have been extracted with boiling water, and the extract dried and weighed.

These determinations have been made on powdered tea, since it is not practicable to take a small sample (10 grains) fairly from a whole leaf tea. The extract has been dried at 212° and weighed, and then fully ignited and reweighed.

Weight of Extract of Teas.

No.	NAME OF TEA.	Aqueous Extract dried at 212°.	Ash of Extract.
1	Siftings	34.40	5.35
3	Gunpowder	43.70	4.30
4	Ditto	34.51	3.25
5	Congou	27.80	3.00
6	Ditto	30.10	4.54
7	Ditto	27.60	3.80
8	Pekoe	35.16	3.86
9	Mixed	23.93	3.65
10	Congou	31.09	4.37
13	Ditto	25.08	3.66
15	Gunpowder	30.54	4.24
17	Black	30.66	4.21
22	Ditto	26.04	3.38
35	Ditto	31.68	4.53
36	Ditto	35.68	6.44
38	Indian Pekoe	41.65	4.60
39	Indian Twankey	39.53	4.93
40	Summer Shoots	38.03	4.98
41	Caper	34.58	4.18
47	Gunpowder (special)	30.35	3.90
52	Ditto	36.70	4.25
53	Hyson	34.70	5.00
56	Congou	27.86	4.80
60	Spent Leaves	8.53	1.53
61	Mixture of 40 per cent. Exhausted Leaves No. 60, } with 60 per cent. Mixed Black Tea }	23.78	3.43
	Average	31.35	4.16

These results are far from regular, and the determination of extract does not appear to be of much value in judging whether a tea is adulterated.

The mixed black tea in No. 61 sample gave nearly 36 per cent. of extract.

The exhausted leaves are of course very different in result; but when the leaves have been re-gummed the difference is far less, as for instance in sample 56.

It will be seen that No. 47, the *special* gunpowder, gives a full proportion of extract, though it is entirely a spurious tea. Yet there may be special cases in which this determination would be of value.

These adulterated samples must not be viewed as a fair average of commercial samples, since several of them were procured for the author at his request by an experienced tea buyer as samples of the worst tea imported.

Adulterations of Coffee, Tea, and Pepper. J. Bell. (*Scientific*

American, 1874, 197; from *Journ. Chem. Soc.*) The adulteration of coffee can only be successfully accomplished after it is roasted and ground, but has, perhaps, been carried to almost as great an extent as that of any other article of food. A very simple way of detecting the presence of chicory in coffee is to sprinkle a little of it on the surface of water in a test-tube or wine-glass, when each particle of chicory becomes surrounded with an amber-coloured cloud, which spreads in streaks through the water until the whole acquires a brownish tinge; with pure coffee, however, no cloud is produced until the lapse of about a quarter of an hour. Another method of detecting adulteration is by the colour obtained by the infusion of a given weight of the suspected article in water, and by the density of the infusion. The use of the microscope, however, is indispensable. The ash of coffee, remarkable for the minute quantity of silica it contains, and for the absence of soda, afforded a valuable indication of its purity.

Adulterations of Tea. Tea is adulterated to a very large extent, not only with leaves of various kinds, including exhausted tea leaves, but also with inorganic substances, such as quartz, sand, and magnetic oxide of iron; these latter substances are rolled up inside the leaf, and one sample of green tea examined was found to contain no less than 20 per cent. of quartz and 8.6 per cent. of the magnetic oxide. The latter may readily be separated by grinding up the tea, and removing the magnetic oxide with a magnet. The facing employed for green tea usually consists of French chalk and Prussian blue. In the preparation of exhausted tea leaves, they are rolled up with gum water and then dried, catechu being added in some cases to restore the astringency. The article known as the "maloo mixture" consists essentially of exhausted tea leaves. In searching for the presence of leaves other than those of the tea plant, the best method is to heat a small quantity of the suspected tea with water, until the leaves are sufficiently softened to admit of being unfolded. It should then be spread out on a piece of glass, and carefully examined as to the nature of the serrations and the character of the venation, also the appearance of the epidermis and the stomata, and the peculiarities of the hairs as shown by the microscope.

Adulterations of Pepper. The two kinds of pepper, known in commerce as black and white pepper, are derived from the same plant, but differ in the latter being bleached, or having the husk removed by washing; but neither kind can be adulterated with success before it is ground. The most common adulterants are linseed meal, the husks of mustard seeds, rice, bean and pea meal, and the flour and bran of the ordinary cereals, ground chilies being added to

restore the pungency. Some of these substances can be readily detected by diffusing the pepper in water, and pouring the mixture on to a muslin sieve. The deep red particles of the chili can then be recognized, and also the camphor-like fragments of rice. The mustard husks are known by their cup-like shape, while the smooth shiny appearance of the linseed readily distinguishes it from the dull brown of the pepper.

Action of Normal Milk on Litmus. A. Vogel. (*Pharmaceut. Centralhalle*, xiv., 285.) The literature of the chemistry of milk presents a great diversity of opinion in reference to the chemical reaction of normal milk, which is stated to be alkaline by some and acid by others. Soshlet has endeavoured to explain these conflicting statements by showing that normal milk turns both blue and red litmus paper violet, and therefore combines a slightly acid with a slightly alkaline reaction. The alkalinity he attributes to neutral phosphates, and the acid reaction to acid phosphates of potassium and sodium. The author has made numerous experiments on this subject, in which he used blue and reddened tinctures of litmus, as these are more reliable indicators of acid and alkaline reactions than the litmus papers. He did not meet with one sample of milk showing a distinct alkaline reaction, all the samples examined being either neutral or weakly acid. The acid reaction appeared to be due to carbonic acid, as milk slightly reddened by tincture of litmus turned blue upon boiling or even upon long continued shaking.

In another series of experiments with the fresh milk of 30 different cows, the author employed Mohr's violet litmus paper, which is a delicate indicator both of acid and alkaline reactions. Most of these samples were found to be slightly acid; some were alkaline, this reaction being apparently due to free ammonia; and two showed distinctly the double reaction above alluded to.

Detection of Formic Acid in Glycerins. Dr. H. Hager. (*Pharmaceut. Centralhalle*, xiv., 234.) As the German Pharmacopœia recommends a solution of ammonio-nitrate of silver as a test for formates in glycerin, the author points out that such a solution is also reduced by pure diluted glycerin at a temperature of 50° C. and above. Pure glycerin, however, effects no reduction in the cold, and if a cold aqueous solution of the sample to be tested be mixed with the test solution, and the mixture allowed to stand for half an hour, the formation of a black precipitate would show the presence of formic acid or a formate.

The Testing of Glycerins. MM. Champion and Pellet. (*Pharm. Journ.*, 3rd series, iv., 424.) The following methods of test-

ing the purity of glycerins are recommended by the authors as being convenient in application, and yielding exact results:—

Qualitative Test.—The glycerin diluted with twice its weight of water is treated in the cold—

1. With tribasic acetate of lead. If an abundant precipitate be formed, and rapidly deposited, the presence of a proportion of foreign matter may be assumed, which would make it unsuitable for use in various applications, such as the manufacture of nitro-glycerin, etc. The crude glycerin obtained in treating fats with sulphuric acid is frequently thus contaminated. These foreign matters result from the action of sulphuric acid at a high temperature (about 110°C.), upon the fatty matter itself, or on the impurities it may contain.

2. Glycerin obtained by calcareous saponification also may contain oleate of lime. This may be detected with oxalate of ammonia, which throws down the lime as a clearly perceptible precipitate.

The colour of glycerin is in no way an index of the purity of the product. In all cases it is useful to be assured of the neutrality of the glycerin. The preceding tests are suited for glycerins more or less impure, but not adulterated. [According to the author's experiments, the tribasic acetate of lead separates all the foreign substances due to normal impurity of the product or alteration in the glycerin during its manufacture. Any addition of glucose may be detected by Fehling's solution.

Quantitative Test.—This test should comprehend the determination of the water, the foreign organic matter, the lime, and the glycerin. In France commercial transactions in glycerin are generally based upon the results given by the areometer. This, however, is undesirable, in consequence of the variations in graduation adopted for that instrument. These variations have recently been the subject of investigation, and a report on the verification of the areometer of Baumé has been drawn up by Berthelot, Coulier, and d'Almeida; but whilst acknowledging the value of their labours, the authors prefer trusting to the hydrometer. In the following table the authors have given the densities of various mixtures of water and glycerin, comparatively with the degrees Baumé (as indicated in the above-mentioned report), and also the proportions of water corresponding to the densities. These determinations have been verified by means of pure anhydrous glycerin, prepared by keeping glycerin for several hours at a temperature of 160°C. , and terminating the operation *in vacuo*. The density found was in accord with that given by Berthelot, namely 1.264. The hydrometer used was

pecially constructed, and indicated one-tenth of a degree between 25° and 35° . When water is added to concentrated glycerin, a rise in temperature takes place, but the authors ascertained that the chemical action manifested did not interfere appreciably with the results. The density was calculated according to the formulas $1000 \times \delta + x \times 1 = (1000 + x)\delta'$; where δ = density of the glycerin, x = volume of the water; δ' = density of the mixture determined directly. The densities were taken at 15° C.; but a range of a few degrees above or below does not notably influence the result.

Hydrometer. Weight of litre.	Areometer. Degrees Baumé.	Water. Per cent.	Hydrometer. Weight of litre.	Areometer. Degrees Baumé.	Water. Per cent.
1264.0	31.2	0.0	1235.0	28.6	11.0
1262.5	31.0	0.5	1233.5	28.4	11.5
1261.2	30.9	1.0	1232.2	28.3	12.0
1260.0	30.8	1.5	1230.7	28.2	12.5
1258.5	30.7	2.0	1229.5	28.0	13.0
1257.2	30.6	2.5	1228.0	27.8	13.5
1256.0	30.4	3.0	1227.0	27.7	14.0
1254.5	30.3	3.5	1225.5	27.6	14.5
1253.2	30.2	4.0	1224.2	27.4	15.0
1252.0	30.1	4.5	1223.0	27.3	15.5
1250.5	30.0	5.0	1221.7	27.2	16.0
1249.0	29.9	5.5	1220.2	27.0	16.5
1248.0	29.8	6.0	1219.0	26.9	17.0
1246.5	29.7	6.5	1217.7	26.8	17.5
1245.5	29.6	7.0	1216.5	26.7	18.0
1244.0	29.5	7.5	1215.0	26.5	18.5
1242.7	29.3	8.0	1213.7	26.4	19.0
1241.2	29.2	8.5	1212.5	26.3	19.5
1240.0	29.0	9.0	1211.2	26.2	20.0
1239.0	28.9	9.5	1210.0	26.0	20.5
1237.5	28.8	10.0	1208.5	25.9	21.9
1236.2	28.7	10.5	...	...	...

Estimation of Organic Matter.—50 grammes of glycerin diluted with water are treated with an excess of tribasic acetate of lead, and the precipitate collected on two tared filters, and the lead compound weighed. The whole is then calcined, the residue treated with nitric acid, and then with sulphuric acid; and from the sulphate of lead is calculated the quantity of oxide of lead that was in combination with organic matters, and consequently the proportion of the latter, which rarely exceeds 1 to 1.5 per cent.

Lime may be estimated in the usual manner by oxalate of ammonia.

The authors consider that industrially the tribasic acetate of lead might be used for the removal of organic matter from crude

glycerin. After separation of the precipitate, excess of the lead salt could be removed by a current of sulphuretted hydrogen, and during the concentration of the glycerin the acetic acid set free would be volatilized without injury to the product. The lead salt might be regenerated by calcination, and again converted into acetate.

Amount of Morphia in French Tincture of Opium. By C. Ménière. (*Répertoire de Pharm.*, 1873, 465.) Tincture of opium according to the French Codex is made by dissolving extract of opium in spirit of 56 degrees. The author found that when common water instead of distilled water is used in making the extract, the tincture prepared from the latter deposits a precipitate which, in addition to the mineral constituents of the water, contains morphia, and the amount of this alkaloid in the tincture is thus diminished. He examined 1.20 grammes of such a deposit from an extract of opium, in the preparation of which water from the Loire had been used, and found it to consist of—

Carbonate of Calcium.	.	.	.	.	.	}	0.99
Chloride of Sodium	.	.	.	.	.
Sulphate of Aluminium	.	.	.	.	.
Silica	.	.	.	.	.
Morphia	.	.	.	.	.	.	0.21
							<hr/>
							1.20

The Action of Carbon Bisulphide upon Benzoin, Tolu, the Resins, and the Gum Resins. M. Guichard. (Abstract of a paper read before the Paris Société de Pharmacie; from *Pharm. Journ.*, 3rd series, iv., 966.) In a former note* the author described some large crystals which had formed in a flask where benzoin had been allowed to macerate for a considerable time in carbon bisulphide. From their origin and a single examination made upon a small quantity of the crystals, he had been led to suppose that they consisted of benzoic acid. Further investigation, however, has shown that they contain a considerable quantity of cinnamic acid. Benzoic acid melts at 120° C., and cinnamic acid at 134 C°. These crystals melted at from 130° to 131° C. Further, when treated with chromic acid they yielded hydride of benzoyl, a reaction which is characteristic of cinnamic acid. That acid, therefore, exists free in considerable quantities in amygdaloid benzoin, and

* *Year-Book of Pharm.*, 1873, 191.

its existence in Sumatra benzoin has been previously noticed by H. Kolbe and Lautemann.

From the balsams of tolu and Peru carbon bisulphide separates a resinous substance, and crystallizable acids. In order to obtain them in large crystals, the author extracted the acids from tolu with boiling water. These treated with carbon bisulphide, formed around the flask a hollow cylinder, in the interior of which were deposited large crystals that presented exactly the same form as those from benzoin. They melted at 134° C., and, treated with chromic acid, yielded hydride of benzoyl freely. They therefore consisted of cinnamic acid, which confirms previous observations.

The ordinary resins are nearly entirely soluble in carbon bisulphide. The residue is formed of foreign organic matters, and other impurities; and it is sufficient to filter and distil with a water-bath to obtain the resins pure. Balsam of copaiba dissolves completely, and elemi resin, mastic, turpentine resin, burgundy pitch, and colophony may be purified in the same manner. From 300 to 400 c.c. of carbon bisulphide are required for 500 grams of elemi resin.

Gum resins are not entirely dissolved by carbon bisulphide. If the liquid be evaporated, a not very abundant residue is obtained, which has the appearance of a transparent yellow-brown resinous matter.

The insoluble residue presents points of much interest. That from gum ammoniacum is quite white, and if the gum was whole retains the form of the tears. If these be agitated with water, they are broken up, and reduced to a milky emulsion with the greatest facility. The emulsion passes through a filter, and deposits slowly a white matter, which is dried with difficulty into a grey soft mass. It is soluble in solution of potash, from which it is not precipitated by hydrochloric acid. At the same time, it gives off a sulphurous vapour that blackens nitrate of lead paper, and doubtless arises from some carbon bisulphide which is obstinately retained by the white powder, and requires the heat of a water-bath to drive it off completely. It does not reduce Fehling's solution, even after boiling with dilute sulphuric acid. Ether does not dissolve the white matter, but renders it transparent and thick, like collodion, the ether floating above. It is attacked by nitric acid, which gives a yellow derivative, soluble in solution of potash. This potassic combination dissolves in strong alcohol and in water; it is precipitated by hydrochloric acid in yellow flocks. The water from which the white matter is deposited retains, in solution, a substance that energetically reduces Fehling's liquor after the carbon bisulphide has been driven

off by prolonged boiling. This liquor, evaporated in a water-bath, deposits a slightly sweet, very hygrometric, non-crystalline matter. The liquor is acid, and when left exposed to the air becomes covered with green mould. The sweet substance itself, evaporated to dryness, is also slightly acid, at any rate after some time.

Galbanum and sagapenum behave in a manner similar to ammoniacum. The carbon bisulphide dissolves a resin, and leaves a yellowish white insoluble matter; but this matter emulsifies more difficultly than that from ammoniacum, and it is necessary to employ boiling water. Assafoetida resembles ammoniacum in its behaviour.

The author suggests a process for purifying gum resins, based upon these properties, with the object of obtaining pure products for the preparation of plasters. The resins and gum resins are mixed in a flask with a sufficient quantity of carbon bisulphide, allowed to macerate for an hour, decanted, then macerated with a fresh quantity, and the whole filtered through lint. This product is distilled in a water-bath, and yields the resins. The insoluble residue is agitated in boiling water, when it disengages much carbon bisulphide, which may be collected by distillation. The whitish milk thus obtained is thrown upon a hair sieve, and the residue washed with a fresh quantity of water. It is then evaporated to dryness, and the product added to the resins previously obtained. For 1 kilogram of elemi and the quantities of gum resins corresponding to the formula of diachylon plaster of the Codex, in all, 1750 grams, the author employed two litres of carbon bisulphide and two litres of water. He obtained about 1205 grams of resins, 500 grams of gummy matters, whilst there were 200 grams of stones, vegetable debris, etc.

Oil of Erigeron. Eugene J. Weeks, Jackson. (*Pharmacist*, 1873, 36.) Nine samples under examination, obtained promiscuously from different wholesale houses in the country, furnished but four strictly pure oils. The adulterated oils differed very materially in appearance from the pure, possessing a very dark red colour, in distinction to the pale straw colour of the pure commercial oil, and being quite viscid instead of a limpid fluid.

The adulterant found in each of the impure oils was fixed oil. Should alcohol be suspected, the most available test would be the acetate of potassa test, recommended by J. M. Maisch (*Proceedings American Pharmaceutical Association*, 1858, 355).

In case of an adulteration with non-oxygenated oils, the nitroprusside of copper test of Hoppe, noted in the same article would be recommended. The writer, however, failed to obtain any indication

of the presence of any of these adulterants, and therefore gives the reaction with the most prominent tests for fixed oils alone.

1. Pure oil of erigeron, when dropped upon fine white filtering-paper, leaves only a very faint yellow stain at the expiration of three hours; whereas, all of the samples of impure oil give a very dark greasy stain under the same circumstances.

2. Liquor potassæ, when agitated with an equal volume of the pure oil, and then allowed to stand a few hours, separates into two clear layers, imparting to the oil a red colour. But when the impure oils are subjected to the same test, they form a partial emulsion or saponaceous mixture, which settles ultimately into three layers, the intermediate one containing the fixed oil combined with the alkali.

3. Official nitric acid mixed with an equal volume of pure oil upon a watch-glass, at first unites to a uniform brown-coloured mixture, possessing the peculiar odour of fresh-cut hay, which at the expiration of twelve hours concretes upon the outer edge a dark brown resinous substance surrounding the clear limpid fluid in the centre, covered with a thin white film. When an impure oil is subjected to this test the mixture formed is of a black colour, devoid of the peculiar hay odour, and concretes to a black substance surrounding the fluid portion, which is covered with a brown film.

4. Official sulphuric acid, when mixed with an equal volume of oil of erigeron, in all cases forms a black mixture immediately. The impure oil solidifies completely at the expiration of twelve hours, while the pure oil concretes only upon the outer edge in the same length of time.

A New Solvent of Phosphorus: its Preparation and Pharmaceutical Use. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, iv., 441.) The author recommends the black translucent variety of resin, known in commerce as rosin, for dissolving and administering phosphorus, and gives the following directions for preparing the phosphoretted resin.

Take a strong wide-mouthed well-stoppered bottle and weigh it, then melt a quantity of resin sufficient to fill the bottle; let the bottle be warmed, then pour in the resin until the bottle is nearly filled, reweigh, and for every ninety-six parts of resin take four of phosphorus. Now observe that the resin is in a fluid state; if so add the phosphorus, and fix the stopper tightly. Place in a sand-bath previously warmed, and apply heat to 200° C., or 392° F.; digest at this temperature, and shake frequently until the phosphorus is dissolved.

The following formula for its exhibition is suggested :—

R	Phosphoretted resin 4 per cent.	. . .	25 grains.
	Powdered white sugar	. . .	75 "
	Tincture of tolu a sufficient quantity.		

Pulverize the resin, mix with the sugar, and form it into a mass with tincture of tolu, of which 8 to 10 drops are sufficient; then divide into 20 pills. Each pill will contain $\frac{1}{20}$ of a grain. This forms a mass of an excellent consistence, and pills made therefrom retain their form, and present an elegant appearance without the addition of any coating; they have but a faint odour of phosphorus, which may be completely covered by the addition of oil of pepper-mint.

An objection to the above process is raised by Mr. A. C. Abraham (*Pharm. Journ.*, 3rd series, iv., 549), who considers it inconvenient and dangerous to the operator, and calculated to deteriorate the product, by the oxidation of the phosphorus, and by its conversion into the amorphous form.

To obviate these disadvantages, Mr. Abraham proposes the use of some resin fusible below the boiling point of water, and also sufficiently heavy to sink in that liquid. Balsam of tolu will be found to answer both these requirements, and by its use the combination can be effected entirely under water. Experiment has shown that four grains of phosphorus are perfectly dissolved by 96 grains of washed tolu, if melted together under water, and well stirred.

The preparation so made, when examined microscopically, does not show any particles of undissolved phosphorus; and when seen in the dark, and rubbed between the fingers, it gives off a perfectly equally distributed light. It may, therefore, be formed into pills with every confidence in the equal distribution and activity of the phosphorus.

Mr. Abraham's suggestion has been duly considered by the compilers of the British Pharmacopœia of 1874, as will be seen from the officinal formula for "*Pilula Phosphori*."

Solubility of Isinglass in Water. C. Carroll Meyer. (*Amer. Journ. Pharm.*, 4th series, iii., 258.) The author compared the solubility of different kinds of isinglass by first softening each separately with 8 fluid ounces of water, and then boiling each with an additional 8 fluid ounces, and filtering, after all the soluble matter had been extracted. His results show that the Russian variety is the most soluble, and the American strip the least soluble.

Isinglass.	Quantity Used.	Soluble.	Insoluble.
American Strip	. 100 grains.	70 grains.	30 grains.
American Sheet	. 100 „	82 „	18 „
Russian	. 100 „	88 „	12 „
Prussian	. 100 „	80 „	20 „

As aqueous solutions of isinglass are liable to undergo decomposition, the author recommends the addition of one part of glycerin to 15 parts of solution of isinglass, which he found to prevent decomposition for a considerable time.

The Application of Petroleum Benzin for Exhausting Oleoresinous Drugs. J. P. Remington. (From the Transactions of the American Pharmaceutical Association, Sept. 1873.) Many uses have been discovered for petroleum benzin since it became an article of commerce, and though but recently brought to notice, its applications, from thinning white lead to purifying rare alkaloids, from dissolving indiarubber to removing grease from a silk dress, have secured for this product of mother earth a name and a place not to be despised.

The immense and overgrown development of the petroleum interest has tended to reduce the price of benzin to a very low figure. The common unpurified article is a drug in the market; and although efforts are constantly made to fit it for illuminating purposes, a means of rendering it free from liability to explode, and cause fearful accidents, is yet to be discovered.

The purified benzin commands a much better price, is put to finer uses, and should alone be used for solvent purposes in pharmacy; the common article is unfit for any purpose in a preparation, for it will be sure, from its offensive odour, to leave its tracks in it.

The first requirement in answering the query, what merit has petroleum benzin as a solvent for the extraction of oleoresinous drugs, like buchu, chenopodium, etc., was believed to be to secure a good benzin. This was readily done, and an article having the specific gravity of 0.642 was obtained, which on being tested proved to be free from objectionable impurities, and no odour was left on a clean sheet of paper when a small portion was poured on it, and suffered to evaporate.

Eight ounces of finely powdered buchu leaves were taken, and firmly packed in a Squibb's glass percolator, with the siphon arrangement. It was found to be best, however, to substitute the rubber lid for one made of wood, the wooden lid having a groove cut in the under surface to fit the rim of the percolator, and at the bottom of the groove a rubber band made the joint air-tight.

After allowing the powder to macerate for four days, the siphon was started, and the percolate, very dense and highly charged with extractive matter, came over, at first slowly, and afterwards rapidly; after two pints had passed, the buchu seemed to be exhausted, and so great had been the solvent power of the menstruum, as far as the chlorophyll and other colouring matter was concerned, that the residue looked as if it had been bleached.

The percolate was allowed to evaporate spontaneously, and the amount of oleoresinous extract obtained weighed 305 grains. This, at first sight, was supposed to contain all of the active properties of the drug; and in order to test it, five grains were swallowed in a little water by the writer, producing, however, but little diuresis; the dose was increased to ten grains, which had but moderate effect.

Taking the dose of fluid extract of buchu at a fluid drachm, and granting that one fluid ounce of the extract represents one troy ounce of the drug, it can readily be seen by a simple calculation, that if the benzin had fully extracted the virtues of the buchu, five grains of the oleoresinous extract obtained would produce the same effect as a fluid drachm of the fluid extract, whilst ten grains would be a large dose.

This fact suggested, that although the buchu had every appearance of being thoroughly exhausted, it might yield some activity to alcohol, and it was then percolated with stronger alcohol, and a dense dark-coloured liquid obtained, possessing a bitter taste and considerable odour.

Ten grains of this liquid produced active diuresis, and the writer has no hesitation in asserting that he believes alcohol to be much the better solvent for buchu.

Various other experiments with other drugs are now progressing, but sufficient progress has been made to justify the assertion that the uses of benzin in this direction are circumscribed; the principal objections to its use being inflammability, great volatility, requiring the use of apparatus not always at the command of all pharmacists; the odour is objectionable generally, and in many cases could not be tolerated by a weak stomach. A continuance of this subject was requested, in order to obtain further information with other plants.

Valerianate of Quinine. Dr. G. C. Wittstein. (*Vierteljahresschrift für pract. Pharm.*, xxii., 288.) The author reaffirms the existence of a valerianate of quinine containing 24 equivalents of water, which has been disputed by Dr. Hager (*Pharmaceut. Central-*

halle, 1873, 32), and refers to his previous researches on this salt which were published in the *Repert. f. Pharm.*, lxxxvii., 295.

Yield of Extracts. H. Werner. (*Neues Jahrb. für Pharm.*, xl., 174.) The author has examined a considerable number of vegetable drugs, with reference to their yield of extract, and gives the following tables, showing his results along with those previously obtained by Hager and Kostka (*Archiv der Pharm.*, 148, 217). A comparison of these results will show how much some drugs, when obtained from different sources, may differ in their percentage of extract.

Extract of aloes was prepared by boiling small pieces of Socotrine aloes with water until a homogeneous liquid was obtained, allowing to stand for 48 hours, decanting from the deposited resin, straining, and evaporating.

The ethereal extracts were made by three consecutive percolations, and displacing the last portion of the ether by water instead of pressing.

All the extracts were made from drugs of the very best quality, and this may perhaps account for some of the differences exhibited in the tables. In the case of extractum opii the author could never realise as much as 50 per cent., though he used the best Smyrna opium. The enormous difference between his results and those of Hager, in reference to extractum rubiæ tinctorum and extractum cort. nuc. juglandis, appear inexplicable.

Extractum Aloes	Percentage according to		
	Hager.	Kostka.	Werner.
Extractum Aloes	45	50	60
„ „ Acid. Sulph. corr.	—	—	70
„ Arnici Rad.	30	—	20
„ Aurantii Cort.	—	—	41
„ Belladonnæ ex herb. recent.	4·5	—	2·3
„ Calabar Fabar.	—	—	7
„ Calendulæ ex herb. recent.	4	—	2·3
„ Calumbæ	11	10	11
„ Campechian. Ligni.	10·5	7	11
„ Cardui Benedicti	22·5	34	22
„ Cascarillæ	16·5	8·5	14
„ Catechu Aquosum	—	—	28
„ Centaurii Minoris	25	25	17
„ Chelidonii ex herb. recent.	5	—	3
„ Cinchon. Flav. frigide paratum	—	8·5	17
„ „ Pallidæ, Pharm. Germ.	—	14	16
„ „ „ frigide paratum	12	15	15
„ Coffeæ	—	—	10
„ Colchici Sem. Acid.	—	25	25

Extractum		Percentage according to		
		Hager.	Kostka.	Werner.
	Colocynthis	18	32	24
"	Croci	50	—	62
"	Cubeb. Æther.	17.5	—	26
"	Digitalis ex herb. recent.	5.5	—	4.5
"	Dulcamaræ	15	16	20
"	Ferri Pomati	—	4.5	6.5
"	Filicis Æther.	10	—	6.5
"	Frangulæ Cort.	—	—	35
"	Fumarisæ	20	—	24
"	Gentianæ	33	27	28
"	Granati Cort. Spirit.	20	—	24
"	Gratiolæ ex herb. recent.	5	—	2
"	Guaiaci Ligni	3	—	2
"	Helenii, Pharm. Germ.	—	31	33
"	Humuli Lupuli Spirit.	20	—	20
"	Hyoscyami ex herb. recent.	3.5	1.5	2.3
"	Ipecacuanhæ	—	—	5.2
"	Jugland. Fol. sicc.	—	—	33
"	" Cort. nuc.	20	—	50
"	Lactucæ Virosæ ex herb. recent.	4	—	2.3
"	Mezerei Spirit.	9	—	9
"	Myrrhæ	38	50	60
"	Nicotianæ ex herb. recent.	—	—	4.5
"	Opii	50	51	45
"	Pimpinellæ	16	20	27.5
"	Polygalæ	30	—	30
"	Pulsatillæ ex herb. recent.	5	—	5
"	Quassisæ Ligni	7.5	3	4
"	Ratanhiæ	17	12	11
"	Rubiæ Tinctorum	18	—	50
"	Sabinæ	20	—	25
"	Santonicæ Æther.	20	—	20
"	Saponariæ	35	—	50
"	Scillæ, Pharm. Germ.	37	—	40
"	Secalis Cornuti	15	14	20
"	Strychn. Nuc. Vom. Spirit.	7	10	6.5
"	Senegæ	33	23	25
"	Sennæ	28	—	35
"	Taraxaci ex herb. sicc.	—	22	25
"	" " recent.	—	5	5
"	Trifolii	25	34	32
"	Valerianæ, Pharm. Germ.	15	—	22

Adulteration of Powdered Ipecacuanha. John Mercer. (*Pharm. Journ.*, 3rd series, iv., 569.) The author draws attention to the occurrence of almond meal as an adulterant in powdered ipecacuanha. He detected it in two samples of the powder obtained

from a very respectable London house. The powder thus adulterated, when made into a paste with water, and kept in a moderately warm place for about half an hour, emits the odour of the oil of bitter almonds. A small quantity of this paste, when heated with water in a small retort, yields a distillate, in which hydrocyanic acid can be readily detected.

Adulterated Lycopodium. B. Lillard. (*Pharmacist*, 1873, 283.) The author met with a sample of lycopodium which, when used for covering pills, adhered in irregular masses. It was of an unusually light colour, and when exposed in thin layers to the air for 24 hours, it lost much of its mobility, and readily adhered in lumps. Upon rubbing a small quantity with water in a mortar, the peculiar odour of dextrin was recognized. A close examination showed the presence of 50 per cent. of dextrin.

Dextrin is well adapted for the adulteration of lycopodium, and a mixture of equal parts, if slightly coloured, possesses the general characteristics of the pure article, and would ordinarily pass unnoticed, except that if exposed in a damp place, it is apt to attract moisture, which causes its particles to adhere.

The Physiological and Therapeutic Action of Emetine. Dr. A. E. D'Ornellas. (*Pharm. Journ.*, 3rd series, iv., 575.) Under the above title the author has written a lengthy memoir. The following are the principal conclusions which he has formed.

1. Emetine is the active principle of ipecacuanha, to which its powerful physiological and therapeutic action is due.

2. The fat odorous nauseous principle is but an accessory.

3. In medical practice, emetine should not be substituted for ipecacuanha, as it is not so perfect a medicament.

4. Emetine has an irritating topical action upon the mucous membrane, and upon denuded flesh, but not upon the intact skin.

5. Emetine injected hypodermically into animals or human subjects induces vomiting, as when administered by the stomach, but more slowly and in larger doses.

6. Emetine introduced into the circulation is always eliminated by the gastro-intestinal mucous and liver, and it causes vomiting up to the moment of its elimination.

7. Emetine during its elimination by the intestinal mucous causes stools more numerous in proportion as its emetic action has been less energetic.

8. In moderate doses, emetine diminishes the respiration and, slightly, the circulation; it lowers the animal temperature, but does

not change directly the vascular tension. In emetic or nauseating doses the action is the same but more energetic.

9. Emetine has an anticonvulsivant action, and by the relaxation it produces in the voluntary muscles combats effectively the convulsions caused by carbolic acid or strychnia.

Adulterations of Oil of Gaultheria. (*Archiv der Pharm.*, 1874, i., 372; from *Amer. Journ. of Pharm.*, 1873, 528.) Adulterated oil of gaultheria appears to occur frequently in commerce.

Dr. W. H. Pile detected chloroform in a sample of the oil by taking its specific gravity and boiling point. The spec. gr. of the true oil is 1.18, whilst that of the sample in question was 1.24. The boiling point of the true oil is 400° F. (186.66° C.); that of the adulterated oil was 200° F. (93.33° C.). On shaking the adulterated oil in a test-tube, after warming gently, the odour of chloroform became quite distinct. By mixing pure oil of gaultheria and chloroform in various proportions, he ascertained that the adulterant in the examined sample of oil amounted to 20 per cent.

C. Bullock has also met with adulterated gaultheria oil which he examined by fractional distillation. After separating the chloroform from the oil, he found a considerable quantity of oil of sassafras. The composition of this oil was 4-5 parts of oil of sassafras, one part of oil of gaultheria, and sufficient chloroform to bring up the specific gravity to the right point.

Prof. Maisch states that oil of gaultheria adulterated with oil of sassafras, when treated in the cold with commercial nitric acid, separates a deep red resinous mass, whereas the pure oil is not coloured by the process.

Oleate of Mercury. H. N. Fraser. (*Pharmacist*, 1873, 236.) The preparations of mercury for external use have been experimented on by pharmacists and physicians, since their introduction to medicine, with the view of making a liniment or an ointment which would soften the parts applied to, be easily absorbed, and combine those essential properties with that of a pharmaceutical preparation which would not be obnoxious to the patient on account of its appearance or smell.

The ointments of mercury which have been heretofore prepared are either a mechanical mixture of mercury or some of its combinations with lard and cerate, or the ointment of nitrate of mercury, which at best is so unstable in its chemical nature, and so often unsatisfactorily made, that many physicians have been disappointed in its use, where an ointment was indicated, calculated to present mer-

cury in a form in which it is readily absorbed without causing much irritation and inflammation.

Lately a preparation of mercury has been made which seems to answer the requirements of this sort of application better than any of the former—namely, the oleate of mercury, or oxide of mercury dissolved in an excess of oleic acid; and several formulæ have already been published in the pharmaceutical journals for its manufacture.

After experimenting with the several methods, a conclusion was reached that a more satisfactory ointment can be made by separating the acid with which it is made in the shop, although the cost of the product will be somewhat larger.

Oleic acid, as found in commerce, is a light-brown coloured oily liquid, with a rancid taste and smell; it is a product from the manufacture of soap, and unless trouble is taken to chill and separate the solidifiable impurities from the acid, the oleate will have an opaque appearance, and the rancid smell observable in the acid,—a defect which destroys one of the important features of the preparation; and an hour's experimenting will convince the pharmacist that it will be profitable to take the time and trouble to manufacture the acid himself, at least until it shall have come so generally into use that it may be obtained pure from the manufacturing chemist.

Almond oil is used in most of the published formulæ, and makes a good acid, but the product obtained was only about 25 per cent. of the bulk of the oil; and, after examining the amounts of olein in various oils, the oil of cotton seeds, described as "winter oil," which has been deprived of most of its stearin by chilling and pressure, was considered best to use.

It was first saponified with potassa, using a slight excess of the base, then treated with tartaric acid, or any other acid which will make a soluble salt with potassa, until the base is completely neutralized; washed until a mass is left, about the consistence and colour of cerate, free from any of the salt; this is heated for several hours with nearly its weight of litharge, and three or four times its bulk of water; the resulting compound is shaken up, while yet warm, with ether, and allowed to stand until all the insoluble matter separates.

This separates the stearate, and leaves a nearly pure oleate of lead. The clear liquor is decanted, and briskly shaken with dilute muriatic acid for a few minutes, to precipitate all the chloride of lead, the lighter liquid washed to remove traces of muriatic acid, and filtered; the filtrate heated slowly on a water-bath, and the ether distilled until the residue ceases to have an ethereal odour.

The product is about 50 per cent. of the bulk of the oil, a light straw-coloured liquid, sp. gr. about 0·800, nearly tasteless, of the consistence of almond oil in the summer time, and having a slight ethereal odour. It has a very slight acid reaction at first, but gradually assumes a more decided acid character, and is pure enough for all practical purposes.

The oxide of mercury used was the yellow oxide, made by adding a solution of corrosive sublimate to a solution of nearly twice its weight of potassa, collecting and washing the precipitate, and drying it at a heat of not more than 120° F.; a higher heat changes it into the red oxide, which is not so soluble in the oleic acid.

This oxide dissolves readily in the acid, by first rubbing them together in a mortar, and keeping at a heat of about 120° F., until they are completely united. The consistence of the mixtures varies from that of a thick oil to that of a jelly, according to the quantity of oxide. The colour is first yellowish brown, but gradually becomes darker when exposed to the light.

Morphia can be added to the mixture in any desired quantity, by first dissolving it in a part of the oleic acid.

The cost of preparing oleate of mercury by this method would be about three dollars per pound, calculating that three-fourths of the ether required in its manufacture be saved. The difference in quality between this and that made from commercial acid will more than amount to the difference in price.

An ointment can be made by double decomposition between oleate of potassa and nitrate of mercury, and diluted to any required strength with cerate or ointment of rose water, but the product will not have the absorbing power of the excess of oleic acid.

The indications are that this preparation will come into more general use, and will claim the attention of pharmacists to its manufacture.

The Dilution of Alcohol. M. Berquier. (*Pharm. Journ.*; from *Répert. de Pharm.*, i., 628.) The following table, compiled by the author, shows the proportion of distilled water required to reduce alcohol of certain degrees of strength to those of greater dilution. Opposite to the figure representing the degree of strength of the alcohol which is to be diluted, will be found the proportion of alcohol and water to be used to reduce it to the strength given at the top of the respective columns. Thus if it be desired to prepare alcohol of 80° from that of 94°, the figure 94 is sought for under the heading, "Strength of Alcohol employed," then to the right, under the head "Strength required, 80°," will be found the figures 808 and

192, indicating that 808 parts of alcohol of 94° and 192 parts of distilled water will yield 1000 parts of alcohol of 80°. For the convenience of English pharmacists, the specific gravities corresponding to the different percentages of alcohol have been added.

Table indicating the Proportions by Weight of Alcohol of Different Strengths and of Distilled Water required to produce 1000 parts of Alcohol of Lower Strength.

Strength of Alcohol employed.		STRENGTH REQUIRED.												STRENGTH REQUIRED.	
		90°=sp. g. 8225.				86°=sp. g. 8357.				80°=sp. g. 8483.				Specific Gravity.	
In degrees corresponding with percentage of Alcohol.	Specific Gravity.	Alcohol.		Water.		Alcohol.		Water.		Alcohol.		Water.		Alcohol.	
		Alcohol.	Water.	Alcohol.	Water.	Alcohol.	Water.	Alcohol.	Water.	Alcohol.	Water.	Alcohol.	Water.	Alcohol.	Water.
100°	7938	857	143	795	205	735	265	522	478	482	518	732	268	677	323
99	7969	871	129	807	193	747	253	530	470	490	510	744	256	688	312
98	8001	885	115	820	180	759	241	539	461	498	502	756	244	699	301
97	8031	899	101	833	167	771	229	547	453	506	494	768	232	710	290
96	8061	913	87	846	154	783	217	555	445	514	486	781	219	722	278
95	8089	927	73	859	141	796	204	564	436	522	478	794	206	734	266
94	8118	942	58	873	127	808	192	573	427	530	470	807	193	747	253
93	8145	956	44	886	114	820	180	582	418	538	462	819	179	759	241
92	8172	970	30	899	101	832	168	590	410	546	454	835	165	772	228
91	8199	985	15	913	87	845	155	599	401	554	446	849	151	785	215
90	8228	—	—	927	73	858	142	609	391	563	437	864	136	799	201
89	8254	—	—	941	59	871	129	618	382	571	429	880	120	813	187
88	8279	—	—	955	45	884	116	627	373	580	420	896	104	828	172
87	8305	—	—	970	30	898	102	637	363	589	411	911	89	843	157
86	8331	—	—	985	15	912	88	646	354	598	402	928	72	858	142
85	8357	—	—	—	—	926	74	656	344	607	393	946	54	874	126
84	8382	—	—	—	—	940	60	667	333	616	384	963	37	891	109
83	8408	—	—	—	—	955	45	677	323	626	374	981	19	907	93
82	8434	—	—	—	—	969	31	687	313	636	364	—	—	925	75
81	8459	—	—	—	—	984	16	698	302	646	354	—	—	943	57
80	8483	—	—	—	—	—	—	709	291	656	344	—	—	961	39
79	8508	—	—	—	—	—	—	720	280	666	334	—	—	980	20

Detection of Ergot in Rye-Flour. Professor Böttger (*Chem. Centralblatt*, 3rd series, ii., 624.) A sample of the flour is mixed in a test-tube with ether and a few small crystals of oxalic acid, and the mixture boiled for a few minutes. If after cooling and allowing the flour to subside, the supernatant liquid appear red, ergot is present in the sample.

Purification of Extract of Nux Vomica. M. Bernbeck. (*Pharmaceut. Zeitung*, xix., 306.) Spirituous extract of nux vomica always contains more or less of a fatty oil, which, being a very undesirable constituent, should be removed. To do this the author recommends that the extract be pressed in thin layers between filtering paper, and the latter renewed until the oil is completely absorbed.

[The author's remarks refer to the extractum nucis vomicæ spirituosum of the German Pharmacopœia, which is made with spirit of '892 specific gravity. As the extract of the B.P. is made with a stronger spirit ('838), the fatty oil is likely to occur more commonly and in larger quantities in this than in the German extract.]

Butter Testing. Dr. J. Campbell Brown. (*Chemical News*, July 4th, 1874.) Butter, when examined microscopically, exhibits a large number of the same minute round fat globules as are observed in milk cream. It consists of a mixture of neutral fats, the glycerides of the non-volatile acids, palmitinic acid ($C_{16}H_{32}O_2$) and butyroleic acid ($C_{12}H_{20}O_2$); and the glycerides of the volatile acids, butyric acid ($C_4H_8O_2$), capronic acid ($C_6H_{12}O_2$), caprylic acid ($C_8H_{16}O_2$), and caprinic acid ($C_{10}H_{20}O_2$) (Wagner and Crookes). The last four glycerides are the characteristic fats of butter.

When butter has become decomposed, the rancid taste and smell make its condition evident to every one. The skill of the analyst is most frequently directed to the detection of fats from the flesh of animals or from the vegetable kingdom. The fats which are generally used as adulterants or as substitutes for butter are suet, tallow, dripping, lard, a mixture of refined fats sold under various names, palm oil, and other vegetable oils. The most characteristic ingredients in these fats are stearin, margarin, and palmitin.

Stearin is a crystalline fat melting at $144^{\circ}F.$, and solidifying at $124^{\circ}F.$, soluble in hot ether, or in seven times its weight of boiling alcohol, but deposited from both solutions on cooling.

Margarin forms scales soluble in warm ether, and melting at about $116^{\circ}F.$

Palmitin is a solid crystalline fat, melting at from 113° – 143° , and solidifying at 114° . It is readily soluble in ether, sparingly so in alcohol. Stearin, margarin, and palmitin are seldom obtained pure:

they occur dissolved in olein and other oils which lower the melting point. For instance, mutton and beef suet, lard and palm oil, melt at temperatures from 25° to 55° below the melting points of stearin and palmitin.

In drawing up the following table for the examination of butter, the author has made use of the observations of Dr. Ballard (*Chemical News*, vols. iv. and v.), and the scheme of Dr. Parkes ("Hygiene," chap. v., section xi.); but has relied chiefly on his own observations on a large number of samples from different sources, made during the years 1871 and 1872.

Table for the Examination of Butter.

1. Weigh out an ounce of the sample of butter to be tested, place it in a test-tube seven-eighths of an inch in diameter, and melt by placing the tube in hot water. Place a thermometer with a pear-shaped bulb, so that the bulb shall be in the middle of the fat, about one inch below the surface, and allow the whole to cool spontaneously. If the quantity of water in the butter be large, it will collect in the tube below the fat; the casein will also collect in the lower part of the tube. Watch the mass as it cools, and note when solidification commences and when it is complete. The following are the average solidification points.

With pure butter the thermometer is obscured between 74° and 68° , and the mass is solid at 60° .

Beef dripping obscures the thermometer at 79° , and is solid at 72° .

Mutton dripping obscures the thermometer at about 85° , and is solid at 84° .

Lard obscures the thermometer at 84° , and is solid at from 79° to 70° , but it often remains as soft as butter at a much lower temperature.

Mixtures solidify at intermediate temperatures.

2. Determine the quality of the butter by the taste and smell of the recongealed fat and of the original sample.

3. Examine several portions of the original sample by means of a good microscope, using a one-quarter inch or one-fifth inch object-glass. In butter made from milk or cream, nothing is seen except the characteristic globules, and the granular masses of curd, and the cubical crystals of salt. The hard fats of butter are present in the globules in a state of solution, and are not recognizable in a separate form.

If stearic acid, stearin, or palmitin, be present in separate form,

they will be recognized by single fusiform crystals, or star-like aggregations of acicular crystals. They indicate the presence of melted fats.

Other substances, such as starch, flour, palm oil corpuscles, Irish moss, colouring matter, etc., may also be distinguished by the microscope, as distinct from butter or fats.

4. Examine the same portions with the same object-glass, together with a polariscope, consisting of two Nicol's prisms and a selenite plate. The crystals referred to in (3) when viewed by the polariscope are more distinctly defined. Particles of suet and other fats, which have not been melted, may also be distinguished by their action on polarized light, by their amorphous form, and by their membranes.

5. Repeat the microscopic examination after the addition of tincture of iodine, acetic acid, and other reagents usually employed to detect substances other than fat.

6. Weigh carefully a convenient quantity of the sample, say 1 oz., in a tared porcelain dish, evaporate in a water-bath, or in an air-bath, at 212° , until free from water, and weigh again; the difference is the amount of water per ounce, which should not exceed 35 grs. (5 to 10 per cent.; Parkes).

7. Dissolve the residue in ether, warming gently until the whole of the fat is dissolved, filter through a weighed filter-paper, collecting the filtrate in a beaker, then wash the dish and filter-paper with ether until a total of 5 or 6 oz. has been used, and allow the whole to stand for some time at a temperature of 65° .

8. Dry the precipitate on the filter-paper, and weigh; deduct the weight of filter-paper; the remainder is approximately the amount of curd, or casein, and salt.

9. Wash the precipitate with boiling water, dry at 212° , and weigh; deduct the weight of filter-paper; the remainder is the amount of curd or casein, which, in good butter, should not exceed 15 grs. per oz. (3 to 5 per cent.; Parkes).

10. Estimate the salt, by means of nitrate of silver, in the aqueous washings from (9), or wash another weighed portion of butter thoroughly with distilled water, and determine the salt by nitrate of silver. It should not amount to more than 8 grs. per oz. in fresh butter (0.5 to 2 per cent.), or 35 grs. per oz. in salt butter (8 per cent.; Parkes).

11. If the ethereal solution of the fat from (7) has formed a deposit at 65° , decant and filter off the clear solution, and examine the deposit, which is probably stearin, according to (12).

Evaporate the ethereal solution down to 4 oz., and allow it to stand for several hours at 65°. Filter off the deposit, which probably still contains stearin, and examine it also according to (12).

Allow the ethereal solution to evaporate down to 3 oz., and allow it to stand for some time at 65°. Filter off the deposit, which may still contain some stearin mixed with palmitin, and examine it separately according to (12). If the butter is adulterated, some of the stearin, and much of the palmitin, will still remain in solution, and may be obtained by continuing the process of spontaneous evaporation.

Some samples of pure butter yield no deposit from 3 oz. of ether at 65°; but fairly good butter will generally form a slight deposit, the amount of which varies in different samples. A sample of butter known to be pure should be examined side by side with the sample suspected to be adulterated; and, as winter butter is a more solid fat than summer butter, the former should be chosen for the comparative experiment.

12 (a). Place each of the above-mentioned deposits in a thin weighed glass tube, and after driving off the ether by evaporation, weigh the fat, melt it carefully, and allow it to cool gradually. Place a small thermometer with pear-shaped bulb in the melted fat, and observe the temperature at which the latter begins to solidify. When quite cold, again heat the tube gradually by placing it in water, the temperature of which is slowly raised, and observe the melting point of the fat.

(b). Or, melt the fat on a thin glass or porcelain dish floated in water, the temperature of which is slowly raised, a thermometer being placed in the water. In this case the apparent melting point will be 2° or 3° above the correct figure, but the relative differences between the melting points of the several deposits will be the same as in (a).

13. Observe the taste and smell of each deposit.

14. The number of grains per ounce may be reduced to parts per cent. by multiplying by the factor .22857.

The Value of Chloralum as a Disinfectant. (*Pharmaceut. Zeitung*, xix., 320.) With the intention of introducing the use of chloralum in prisons, etc., the Prussian ministry instructed a scientific commission to report upon the value of that substance as a disinfectant. The following is a summary of the report issued by the commission:—

According to the chemical analysis of samples of chloralum occurring in German commerce, the liquid preparation contains but 16 per cent. of chloride of aluminium, 2 per cent. of chloride of calcium, 1 per cent. of hydrochloric acid, and small quantities of

alkaline sulphates. The powder contains 40 per cent. of soluble matter, of which 13 per cent. of chloride and 4 per cent. of sulphate of aluminium are the chief constituents. The active ingredient in chloralum is alumina, and of this it contains a comparatively small quantity. The disinfecting and deodorizing effect of chloride of aluminium is brought about by the decomposition of the latter, whereby its chlorine forms with one of the elements of water hydrochloric acid, which neutralizes and deodorizes the ammoniacal compounds of sewage, whilst the alumina precipitates suspended and dissolved organic matter. The precipitation of organic animal substances by alumina, however, is never complete, as alumina only throws down albuminoids, but not gelatine or chondrin. That a number of other metallic oxides are superior in this respect to alumina may be seen from the following table, giving the results of experiments on the comparative value of various disinfectants, which were conducted at the Chemical Central Station at Dresden :—

Chlorinated Lime disinfected	100	parts of putrid matter.
Quick Lime	84.6	" " "
Alum	80.4	" " "
Sulphate of Iron	76.7	" " "
Chloralum	74	" " "

Sulphate of iron is as odourless as chloralum, and is certainly preferable to the latter on account of its effect and cheapness. Chloralum possesses disinfectant and deodorizing properties, but not to such an extent as is attributed to it by commercial speculators. It is equally certain that its value as a disinfectant is not proportional to its price.

The Adulteration of Pepper. G. Bouchardat. (*Pharm. Journ.*; from *L'Union Pharmaceutique*, xiv., 145.) During the examination of a large number of specimens of ground pepper, the author met with various inert powders, and among those the one most frequently detected was prepared by drying and pulverizing the parenchyma of potatoes, which is left as a residue in the manufacture of starch. Pepper mixed with this adulterant has a more feeble odour; its taste is at first sweetish and afterwards pungent, but less so than that of pure pepper. The mixed powder is uniformly grey, whilst powdered pepper exhibits some blackish particles and some of a yellowish grey colour. Comparison should therefore be made between a suspected powder and one prepared by grinding pepper to the same degree of fineness. Ground pepper mixed with this potato powder floats longer on the surface

of water than that which is pure, and the coloration of the water is different. Solution of iodine, added drop by drop, gives a more intense blue with the potato mixture than with normal pepper.

The other substances found mixed with ground pepper were: (1) lentil flour mixed with earth, which can be detected by the microscope and calcination; (2) chalk; and (3) linseed cake, ground to a degree of fineness comparable to that of ground pepper. By the aid of a good glass the fragments of linseed could easily be seen. In some specimens seized at the custom-house, the powder of sesame seeds was detected; and it appeared probable that in this case, in order to obtain the proper shade for the powder, the adulterator, who had sent from Marseilles several hundred bags of this product, had mixed many sorts of seeds.

White pepper, obtained, as is known, by the decortication of black pepper, is often adulterated with talc, chalk, and starch in considerable proportions. The introduction of these three inert matters may have for its object either the direct increase of bulk or the masking of an imperfect decortication. After the examination of numerous specimens, M. Bouchardat came to the conclusion that many manufacturers supply two products: one, known as *poivre léger*, consisting principally of the cortical part of the pepper, black fragments forming the greater portion of it; the other, known as *poivre blanc*, being mixed with talc or starch, to imitate the shade of white pepper. Although the *poivre léger* contains nothing foreign to pepper, yet, as the useful part is eliminated, the sale of such an article must be looked upon as a fraud upon the part of the dealer. It is also sometimes adulterated with ground grains of paradise, which is easily detected by means of a magnifying glass. In France, to avoid prosecution, the wholesale dealer is said often to sell the ground pepper pure and the mixture intended for its adulteration separately.

The usual adulterants of pepper may be clearly identified by means of a microscopic examination, with an instrument of 300 to 400 magnifying power, in the hands of a skilled person. The powder of pepper is characterized principally by its starch. This appears in compound grains retaining the form of the cells in which they were contained, and which they entirely filled. They are of variable forms and dimensions; M. Mussat has measured them from 0.030 mm. to 0.20 mm. in diameter. The simple grains of which they are formed are, from their juxtaposition, irregularly rounded, and are from 0.001 mm. to 0.0056 mm. in diameter. Under the action of iodine they assume a rather dull violet-blue colour. Solution of

caustic potash attacks them but slowly. This fecula is accompanied by the *débris* of the pericarp, which presents two very distinct forms of cells. In one case they are nearly cubical, with rather thin walls, containing a blackish granular substance, which is the fleshy portion of the pericarp; in the other, the cells forming the endocarp are club-shaped, slightly curved, and have thick canalicate walls. The author found them on an average to be 0.025 mm. wide by 0.062 mm. long. Potato starch is easily distinguished from that of pepper by its simple, more or less rounded or ovoid, sometimes irregularly trigonal, strongly refractive grains, of which the largest measure 0.180 mm. All, except the smallest (which measure about 0.010 mm.), have a conspicuous, often stellate hilum, and their concentric zones are clearly visible. Dilute solution of KHO attacks them rapidly. A yellow tissue contained in several of the specimens examined was distinguished easily by its elongated polygonal cells, with thin, clear, yellow walls, enclosing a slightly darker granular substance. It probably belonged to some oily cruciferous seed, or to linseed.

In consideration of the great skill with which pepper is now adulterated, the author recommends that dealers should, as far as possible, buy their pepper whole and grind it themselves.

Determination of Spirit of Wine in Fousel Oil. G. L. Ulex. (*Neues Jahrb. der Pharm.*, xxxix., 333.) Fousel oil may be imported into England free of duty if it contain less than 15 per cent. of proof spirit. It is tested at the London custom-house by shaking it with an equal volume of water to remove the spirit, and calculating the quantity of the latter from the specific gravity of its aqueous solution. This test, however, gives erroneous results, as fousel oil is a mixture of various alcohols, chiefly ethyl, propyl, butyl, and amyl alcohol, of which only the latter is insoluble in water.

The author recommends the separation of spirit of wine by distillation, as ethyl alcohol passes over at a lower temperature than any of the other alcohols present in fousel oil. 100 c.c. of the latter are heated in a retort until 5 c.c. have passed over; the distillate is then shaken with an equal volume of a saturated solution of common salt, and the mixture allowed to stand. If the fousel oil which separates amounts to one half of the distillate or more, the sample examined is sure to contain less than 15 per cent. of spirit, and is free from any fraudulent admixture with the same; but if less fousel oil or none at all should separate, the presence of more than 15 per cent. of the spirit may be safely assumed. In the

latter case the quantity of the adulterant may be estimated by shaking a sample of the fousel oil with an equal bulk of saturated solution of Na Cl (in which propyl and butyl alcohol are much less soluble than in water), separating the latter, distilling off the spirit, and taking the specific gravity of the distillate.

Pepsin. Dr. C. Symes. (*Pharm. Journ.*, 3rd series, iv., 1.) As few medicines vary so much in point of therapeutic value as pepsin, the author has undertaken a series of experiments with a view of ascertaining the quality of commercial specimens from different makers, and of testing the various processes which have been proposed for its preparation as a medicinal and restorative agent.

100 grains of the hard boiled white of eggs chopped in small pieces were introduced into each of six vials. To five of these 10 drams of distilled water, 10 minims of dilute hydrochloric acid, and 10 grains of pepsin of various kinds were added; in the sixth 4 drams of the distilled water were replaced by the same quantity of pepsin wine, each dram of which represented $2\frac{1}{2}$ grains of pepsinum porci. All were digested under precisely the same conditions at a temperature of 100° F. for 12 hours. The following gives the amount by weight of undissolved albumen in each vial.

No. 1	left undissolved	.	.	.	1½ grains.
" 2	" "	.	.	.	2½ "
" 3	" "	.	.	.	24 "
" 4	" "	.	.	.	28 "
" 5	" "	.	.	.	41 "
" 6	" "	.	.	.	56 "

It may be admitted that in imitating the somewhat obscure work of the stomach by artificial processes lacking the vital agency, the activity of any samples operated on is almost sure to be underrated. Nevertheless, experiments conducted carefully under equal conditions are valuable as affording comparative results; and certain is it that wine or any alcoholic fluid is a most unsatisfactory vehicle for pepsin, also that, when taken with food, it unquestionably retards digestion. The above experiment was several times repeated, first with portions of precisely the same samples, and also with samples by the same makers, but obtained from different sources; the results varied slightly, but bore the same relation to each other. The pepsin Nos. 1 and 2 were both by the same manufacturer, and, as it will be seen, were of good quality; but it is somewhat anomalous that according to the dose given the former should have been about five times the strength of the latter, whereas

it would appear that there is little difference between them. The catalytic action seems to be much more vigorous in the early part of the process of digestion than towards the end; therefore, had a larger amount of albumen been present in the vial No. 1, it is possible a larger amount might have been dissolved, and the residue have been but slightly greater than it actually was. Nevertheless, this could not have been sufficient to account for the great similarity in activity of the two specimens.

Of the processes for its preparation as a medicinal agent, that of precipitating its solution by acetate of lead, and subsequent separation of the lead by hydrosulphuric acid, has probably been longest in use; but its activity appears to be more or less injured by the chemical treatment. The process of M. Brucke, consisting of solution in dilute phosphoric acid, neutralization with lime-water, re-solution in dilute hydrochloric acid, and final treatment with cholesterin, rectified spirit, and ether, yields a product possessing active peptic properties, but is more suitable as a laboratory experiment than for the purpose of manufacture on a commercial scale. Tannin and alcohol have both been proposed as precipitants for pepsin, but I am not aware of any definite process in which these are used for its preparation on a large scale. Next in order is the somewhat primitive process of Dr. Beale. It is given in the *Pharmaceutical Journal*, N.S., vol. ii., 684, and is as follows:—

“The mucous membrane of a perfectly fresh pig’s stomach was carefully dissected from the muscular coat, and placed on a flat board. It was then lightly cleansed with a sponge and a little water, and much of the mucus, remains of food, etc., carefully removed. With the back of a knife or ivory paper-knife, the surface was scraped very hard in order that the glands might be squeezed, and their contents pressed out. The viscid mucus thus obtained contains the pure gastric juice, with much epithelium from the glands and surface of the mucous membrane. It is to be spread out on a piece of glass, so as to form a very thin layer, which is to be dried at a temperature of 100° F. over hot water, or *in vacuo* over sulphuric acid. Care must be taken that the temperature does not rise much above 100°, because the action of the solvent would be completely destroyed. When dry, the mucus is scraped from the glass, powdered in a mortar, and transferred to a well-stoppered bottle.

Several persons who have performed experiments with this (so called) pure digestive powder, including Dr. Beale himself, have spoken highly of its peptic properties. In the author’s hands, how-

ever, the results were not so satisfactory as had been anticipated. The process, too, if carried out strictly according to Dr. Beale's instructions, is a very wasteful one, more pepsin being lost than is obtained; if, on the other hand, it is attempted to obtain a larger quantity, the quality is reduced. The mucus which is directed to be sponged off, and which is usually considerable in quantity, possesses about one third to one half the activity of the mucus which is afterwards directed to be *scraped* off; then, after this scraping, a considerable amount of pepsin remains, which can be demonstrated by dissolving it out.

Lastly, there is the process of Mr. E. Scheffer,* the most satisfactory as regards uniformity of excellence and economy in working of any the author has tried. By this method the preparation can be made to answer strictly to the tests given; it keeps well; it is soluble in an acidulated fluid, and hence might be prescribed in solution of almost any strength. Amongst other experiments performed was one in which a given quantity of the moist mucus scraped from fresh cleansed pigs' stomachs was divided into equal portions, one of which was retained moist, another dried in a thin layer at a temperature not exceeding 100°; from a third portion the pure pepsin was separated by Mr. Scheffer's process, but adding sufficient sugar of milk to bring it to the exact weight of the portion simply dried.

Into each of four vials 100 grains of coagulated albumen, 10 drops of dilute H Cl, and 10 drams of water, were placed; to the first, 10 grains of the dried mucus, to the second 80 grains of the moist (equal to 10 grains of the dry), to the third, 10 grains of the purified saccharated mucus, and to the fourth 10 grains of the same were added. In the last case two drams of water were replaced by the same quantity of sherry wine. After 12 hours' digestion at 100° F., the results were as follows:—

No. 1 left undissolved	31 grains.
„ 2 „ „	22 „
„ 3 „ „	12 „
„ 4 „ „	52 „

From this it appears that undried mucus is more active than the same substance after drying; that the pure pepsin diffused through sugar of milk is more active than the mucus from which it is

* See *Year-Book of Pharmacy*, 1872, 268.

obtained, and again that wine partially destroys the activity of pepsin, and is an unsuitable vehicle for its administration.

The author proposes, therefore, to substitute an elixir for pepsin wine, and to make this by dissolving the purified moist pepsin in raspberry vinegar, so that one fluid drachm shall be capable of dissolving 100 grains of coagulated albumen. This elixir keeps well and is quite palatable.

Amygdalin in Linseed. Dr. Grosschopff. (*Pharmaceut. Zeitung*, xix., 334.) The author found that when linseed-meal is mixed with water, and the paste kept for some time, a distinct odour of hydrocyanic acid is developed on stirring.

2500 grams of linseed cake, when boiled with water in a still, yielded 2500 grams of a distillate containing .143 gram H Cy, which is equal to .0057 per cent. in the *placenta lini*, or .0076 per cent. in the linseed. Nothing has been known hitherto of the occurrence of amygdalin in orders so unlike *Amygdaleæ* and *Rosaceæ* in general as *Linaceæ*.

In an analysis by L. M. Meyer (Berg's *Pharmaceut. Waarenkunde*, 458), it is stated that linseed contains 44.38 per cent. of emulsin, but nothing is mentioned of amygdalin. Flückiger, in searching for the *amylum* stated by Dragendorff to exist in linseed, found numerous granules similarly distributed as amygdalin in bitter almonds. These granules are probably the source of the hydrocyanic acid.

Permanganate of Zinc. H. Adrian. (*Chemist and Druggist*, May, 1874.) A recent report of the Medical College of Berlin, contains an account of the use of this salt for injections. It is stated to be much more effective than sulphate of zinc. The following is the usual way of preparing it:—Permanganate of silver is precipitated by mixing hot concentrated solutions of permanganate of potassium and nitrate of silver, and is afterwards levigated with a solution of chloride of zinc. The chloride of silver is then separated, and the permanganate of zinc obtained by the cautious evaporation of the solution. This is a troublesome and an expensive process, but it has not yet been replaced by a better one. The author's endeavours in that direction have not led to any satisfactory results.

Permanganate of zinc is a dark red crystalline powder, similar in its general properties to the potassium salt. The maximum strength in which it is administered is one grain to an ounce of water.

Linen dipped into a solution of this strength is stained pink; but

the colour fades within a few minutes to a very light brown, so as to become almost imperceptible.

The author also alludes to a case of sophistication, in which sulphate of zinc coloured with permanganate of potassium was sold as permanganate of zinc.

The Decomposition of Milk by Keeping. E. L. Cleaver. (*Pharm. Journ.*, 3rd series, iv., 973.) At a recent prosecution under the Adulteration of Food Act, it was stated in the evidence for the defence that, unless milk be analyzed before it is six hours old, the results were not reliable. With the object of testing the accuracy of this assertion, the author made a series of experiments. A quantity of milk purchased early in the morning was divided into several small portions, and placed in bottles, which were tightly corked. One portion was analyzed immediately after purchase, and the rest from time to time. The results, taken at a temperature of 70° F., were as follows:—

No.	Date of Analysis.	Total Solids.	Fat.	Ash.
1	April 30th, 1874	12·48	3·6	·7
2	May 1st, "	12·37	3·6	·7
3	" 2nd, "	12·18	3·6	·7
4	" 4th, "	12·12	3·6	·7
5	" 6th, "	12·09	3·6	·7
6	" 8th, "	12·07	3·6	·7
7	" 12th, "	11·97	3·52	·7
8	" 18th, "	11·97	3·4	·7

It will be seen by these experiments, extending over a period of three weeks, that decomposition does not, in an average sample, proceed at a very rapid rate; and that in an analysis made even after two or three days the error would be inappreciable.

It was suggested to the author that if milk which had become sour were neutralized with soda, the volatile acids formed would be retained instead of being volatilized by the heat, and that the solid residue would therefore not suffer loss. On trying this plan, however, no difference was obtained from previous results.

But there is one source of loss to be guarded against when milk has become very old, and that is the deposition of mineral matter of some kind on the sides of the containing vessel, to which it adheres very firmly; under the microscope it has a distinct crystalline structure, but at present the exact nature of the compound is not known.

The Rectification of Alcohol by means of Lime. C. Bullock. (*Amer. Journ. of Pharm.*, 1874, 184.)

The process usually employed to obtain absolute alcohol, is distillation of the spirit from quicklime.

The practical result of the process will appear from the following operation.

Fifteen gallons of alcohol, sp. gr. .82361 at 60° F. = 93 per cent. was poured upon seventy pounds of well-burned lime (previously broken into small pieces), in a still, heated by a steam jacket. The still was then made tight, and heated to about 120°; after standing three days, a worm was attached, and distillation commenced, protecting the distillate from the air. Each gallon was collected in a separate vessel, the heat being gradually increased as was necessary to cause the alcohol to pass over slowly.

Ten gallons was all that could be made to pass over by steam heat. Water was then added to the lime in the still, and most of the alcohol recovered as dilute alcohol.

The ten gallons of strong alcohol thus obtained was returned to a still with 25 pounds of quicklime, and the operation, as above, repeated. Eight gallons of alcohol was obtained, separated as before in fractional portions of one gallon.

The specific gravity of the several portions taken on a balance with the one thousand grain bottle, temperature at 60° F., is shown in the following summary :

Gallon.	First Distillation.	Second Distillation.
1st.	.80170	.80978
2nd.	.79756	.79700
3rd.	.69610	.79461
4th.	.79762	.79516
5th.	.80040	.79458
6th.	.79593	.79410
7th.	.79782	.79425
8th.	.79632	.79615
9th.	.79706	
10th.	.79780	
Mean.	.79783	.79695

The density of absolute alcohol varies somewhat with different authorities; Drinkwater and Fownes give .79381, Tralles, .7939, and Gay-Lussac, .7947; taking the mean of these authorities, we have .79413.

It will be seen, on reference to the figures given above, that the

sixth gallon of the second distillation alone is absolute, according to this mean standard, and that the mean of the 3rd, 4th, 5th, 6th, and 7th gallon of the second distillation is $\cdot 79425$, being within the figures given by Gay-Lussac.

It will be noticed that the weakest alcohol distills over first, which would lead to the supposition of an affinity of the lime for the stronger portion of alcohol, or else water having a greater disposition to vaporize in an atmosphere of alcohol vapour.

The distillates all contain lime, which does not separate on standing; the stronger the alcohol the greater appears to be the amount of lime present. Redistillation from over-dry tartaric acid removes the lime (Gmelin), and renders the alcohol perfectly clear.

Analysis of Cinchona Barks cultivated at Ootacamund. Dr. de Vrij. (*Pharm. Journ.*, 3rd series, iv., 869.) The author has analyzed 30 samples of cinchona barks from Ootacamund, sent to him by Mr. McIvor. He prefaces the report of his results with the admission that Dr. Hesse is right in denying the existence of bitartrate of cinchonidine, and that the compound separated from a solution of a salt of cinchonidine by bitartrate of sodium, is nothing but a neutral tartrate of that alkaloid. He now uses Rochelle salt instead of the $\text{Na H C}_4\text{H}_4\text{O}_6$ for estimating the quantity of cinchonidine. As there are well defined bitartrates of quinine, quinidine, and cinchonine, the non-existence of the corresponding cinchonidine salt is a curious fact.

No. 8.—Red bark; Deva Shola plantation. About 6000 feet elevation. A. Original bark, 8 years old.

48.8 grammes of dry bark yielded 5.3 grammes of mixed alkaloids = 10.86 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{14.6}{0.8634}$; $l = 100$ mm.; $a^\circ = 5^\circ \text{ } \epsilon$, was $[a]_D = 84.5^\circ \text{ } \epsilon$.

4.959 grammes of mixed alkaloids treated with ether, yielded 1.692 grammes of alkaloids soluble in ether = 3.705 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.4}{0.67}$; $l = 100$ mm.; $a^\circ = 6^\circ \text{ } \epsilon$, was $[a]_D = 111^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{17.7}{1.232}$; $l = 100$ m.m.: $a^\circ = 3^\circ \text{ } \epsilon$, was $[a]_D = 43.1^\circ \text{ } \epsilon$.

1.016 grammes of alkaloids soluble in ether yielded 0.385 gramme of herapathite = 0.2175 gramme of quinine = 0.793 per cent.

B. renewed bark 24 months old.

49 grammes of dry bark yielded 5.096 grammes of mixed alkaloids = 10.4 per

cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{15.9}{0.85}$; $l = 100$ mm.; $a^\circ = 4^\circ \text{ } \epsilon$, was $[a]_j = 78^\circ \text{ } \epsilon$.

4.484 grammes of mixed alkaloids treated with ether yielded 3.3 grammes of alkaloids soluble in ether = 7.654 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.6}{0.797}$; $l = 100$ mm.; $a^\circ = 10^\circ \text{ } \epsilon$, was $[a]_j = 158^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{12.8}{0.4298}$; $l = 100$ mm.; $a^\circ = 5^\circ \text{ } \text{A}$, was $[a]_j = 148.9^\circ \text{ } \text{A}$.

2.535 grammes of alkaloids soluble in ether yielded 2.728 grammes of herapathite = 1.5413 gramme of quinine = 4.653 per cent.

The results of the analysis of these two barks taken from the same tree are very interesting. Whilst the amount of mixed alkaloids in both barks is nearly the same, the amount of quinine in the renewed bark is so much greater that this fact deserves peculiar attention; for if it should prove to be a general rule that the renewed bark of *C. succirubra* is so much richer in quinine than the original bark, then the millions of trees of *C. succirubra* actually growing in British India could be adapted to produce large quantities of bark fit for the manufacture of quinine.

No. 9.—Renewed red bark, 20 months old. Neddiwattum plantation. Elevation about 6200 feet.

50 grammes of dry bark yielded 4.577 grammes of mixed alkaloids = 9.154 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{15}{0.805}$; $l = 100$ mm.; $a^\circ = 4.2^\circ \text{ } \epsilon$, was $[a]_j = 78.2^\circ \text{ } \epsilon$.

3.971 grammes of mixed alkaloids treated with ether yielded 2.476 grammes of alkaloids soluble in ether = 5.707 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.1}{0.728}$; $l = 100$ mm.; $a^\circ = 8.3^\circ \text{ } \epsilon$, was $[a]_j = 137.9^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{12.6}{0.483}$; $l = 100$ mm.; $a^\circ = 3^\circ \text{ } \text{A}$, was $[a]_j = 78.2^\circ \text{ } \text{A}$.

1.791 gramme of alkaloids soluble in ether yielded 1.58 gramme of herapathite = 0.8644 gramme of quinine = 2.75 per cent.

No. 20.—Red bark, ten years old mossed. Neddiwattum.

50 grammes of dry bark yielded 5.335 grammes of alkaloids = 10.67 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.5}{0.604}$; $l = 100$ mm.; $a^\circ = 2^\circ \text{ } \epsilon$, was $[a]_j = 41.3^\circ \text{ } \epsilon$.

4.805 grammes of mixed alkaloids treated with ether yielded 1.415 gramme

of alkaloids soluble in ether = 3.1421 per cent. The molecular rotation calculated from the observation $\frac{V}{p} = \frac{13.1}{0.441}$; $l = 300$ mm.; $\alpha^\circ = 14^\circ \text{ } \epsilon$, was $[a] j = 138.6^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{13.6}{0.599}$; $l = 300$ mm.; $\alpha^\circ = 1^\circ \text{ } \text{A}$, was $[a] j = 7.5^\circ \text{ } \text{A}$.

0.976 gramme of alkaloids soluble in ether yielded 0.777 gramme of herapathite = 0.439 gramme of quinine = 1.413 per cent.

No. 21.—Red bark, 8 years old. Neddiwattum.

50 grammes of dry bark yielded 4.348 grammes of alkaloids = 8.696 per cent.

The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{13.2}{0.757}$; $l = 100$ mm.; $\alpha^\circ = 2.5^\circ \text{ } \epsilon$, was $[a] j = 43.6^\circ \text{ } \epsilon$.

4.154 grammes of mixed alkaloids treated with ether yielded 1.58 gramme of alkaloids soluble in ether = 3.3075 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.4}{0.511}$; $l = 100$ mm.; $\alpha^\circ = 5.5^\circ \text{ } \epsilon$, was $[a] j = 133.4^\circ \text{ } \epsilon$.

1.068 gramme of alkaloids soluble in ether yielded 0.79 gramme of herapathite = 0.4463 gramme of quinine = 1.382 per cent.

No. 22.—Red bark, the same as No. 20, but unmossed.

50 grammes of dry bark yield 4.088 grammes of mixed alkaloids = 8.176 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.6}{0.696}$; $l = 100$ mm.; $\alpha^\circ = 2^\circ \text{ } \epsilon$, was $[a] j = 36.2^\circ \text{ } \epsilon$.

3.754 grammes of mixed alkaloids treated with ether yielded 1.365 gramme of alkaloids soluble in ether = 2.973 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.5}{0.477}$; $l = 100$ mm.; $\alpha^\circ = 3^\circ \text{ } \epsilon$, was $[a] j = 78.6^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{12.7}{0.692}$; $l = 100$ mm.; $\alpha^\circ = 1^\circ \text{ } \epsilon$, was $[a] j = 18.3^\circ \text{ } \epsilon$.

0.903 gramme of alkaloids soluble in ether yielded 0.638 gramme of herapathite = 0.36 gramme of quinine = 1.185 per cent.

No. 23.—Red bark; Deva Shola; renewed bark, three years old.

26.8 grammes of dry bark yielded 2.779 grammes of mixed alkaloids = 10.37 per cent. The molecular rotation calculated from the observation $\frac{V}{p} = \frac{15}{0.721}$; $l = 100$ mm. $\alpha^\circ = 2^\circ \text{ } \text{A}$, was $[a] j = 41.6^\circ \text{ } \text{A}$.

This abnormal rotation *to the right* made the author suppose that the quantity of cinchonine in this bark exceeded very much that of cinchonidine. The investigation proved that this supposition was

right, as he obtained from 1.577 gramme of alkaloids insoluble in ether, by the use of Rochelle salt, 0.383 gramme of tartrate of cinchonidine = 0.308 gramme of cinchonidine, and 1.269 gramme of cinchonine. Besides these he found a trace of quinidine.

2.755 grammes of mixed alkaloids treated by ether yielded 1.114 gramme of alkaloids soluble in ether = 4.193 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{20}{1.114}$; $l = 100$ mm.; $a^\circ = 7^\circ \text{ } \epsilon$, was $[a]_D = 125.7^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{13}{0.632}$; $l = 100$ mm.; $\alpha^{\circ} = 9.5^{\circ}$ δ , was $[\alpha]_D^{25} = 195.4^{\circ}$ δ .

1.075 gramme of alkaloids soluble in ether yielded 0.918 gramme of herapathite = 0.519 gramme of quinine = 2.024 per cent.

No. 24.—*C. Pahudiana*, original bark, ten years old. Elevation 7800 feet.

55.8 grammes of dry bark yielded 1.402 gramme of mixed alkaloids = 2.51 per cent. The molecular rotation calculated from the observation $\frac{V}{p} = \frac{15.1}{0.51}$; $l = 300$ mm.; $a^\circ = 10^\circ \text{ } \epsilon$, was $[\alpha]_D^{25} = 98.7^\circ \text{ } \epsilon$.

1.402 gramme of mixed alkaloids treated with ether yielded 0.58 gramme of alkaloids soluble in ether = 1.038 per cent.

0.58 gramme of alkaloids soluble in ether yielded 0.032 gramme of herapathite = 0.018 gramme of quinine = 0.032 per cent.

No. 25.—*C. Pahudiana*. A. Original bark.

60 grammes of dry bark yielded 1.214 gramme of mixed alkaloids = 2.012 per cent. The molecular rotation calculated from the observation $\frac{V}{p} = \frac{20}{1.214}$; $l = 100$ mm.; $\alpha^{\circ} = 9^{\circ} \epsilon_c$, was $[\alpha]_D = 148.2^{\circ} \epsilon_c$.

1.1533 gramme of mixed alkaloids treated with ether yielded 0.756 gramme of alkaloids soluble in ether = 1.324 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.7}{0.305}$; $l = 300$ mm.; $a^\circ = 13^\circ \text{C}$., was $[a]_D^{20} = 180.4^\circ \text{C}$.

0.756 gramme of alkaloids soluble in ether yielded 0.612 gramme of herapathite=0.346 gramme of quinine=0.606 per cent.

B. Renewed bark, two years old. The renewed bark grew during the first six months under moss, and was later unmossed.

48.7 grammes of dry bark yielded 2.34 grammes of mixed alkaloids = 4.8 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{12.7}{0.545}$; $l = 100$ mm.; $\alpha^D = 6^\circ \text{ } ^\circ\text{C}$, was $[\alpha]_D = 139.8^\circ \text{ } ^\circ\text{C}$.

2.286 grammes of mixed alkaloids treated with ether yielded 1.125 gramme of alkaloids soluble in ether = 2.362 per cent. 1.125 grammes of these latter

alkaloids yielded 0.66 gramme of herapathite = 0.373 gramme of quinine = 0.783 per cent.

The alkaloids insoluble in ether consisted chiefly of cinchonidine, with a slight trace of cinchonine.

No. 26.—Strong growing seedling *Cinchona*, dark leaved, from lower part of the stem. Kartairy.

This and the following three barks were taken from two very strong growing varieties of *C. officinalis*. The barks, Nos. 26 and 27, were taken from a tree planted in 1868, which is now 26 feet in height, with a stem of 16 inches in circumference at one foot from the ground, and 12 inches in circumference at 15 feet from the ground.

50 grammes of dry bark yielded 5.43 grammes of mixed alkaloids = 10.86 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{13}{0.631}$; $l = 100$ mm.; $\alpha^\circ = 8^\circ \text{ } \epsilon$, was $[a] j = 164.8^\circ \text{ } \epsilon$.

4.644 grammes of mixed alkaloids treated with ether yielded 1.808 gramme of alkaloids soluble in ether = 4.228 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{13}{0.781}$; $l = 100$ mm.; $\alpha^\circ = 10.5^\circ \text{ } \epsilon$, was $[a] j = 174.7^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{13}{0.704}$; $l = 100$ mm.; $\alpha^\circ = 9^\circ \text{ } \epsilon$, was $[a] j = 166.1^\circ \text{ } \epsilon$.

1.78 gramme of alkaloids soluble in ether yielded 2.081 grammes of herapathite = 1.176 gramme of quinine = 2.804 per cent.

No. 29.—Strong growing seedling *Cinchona* from upper part of the stem. Kartairy.

50 grammes of dry bark yielded 3.472 grammes of mixed alkaloids = 6.944 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{13}{0.614}$; $l = 100$ mm.; $\alpha^\circ = 6.5^\circ \text{ } \epsilon$, was $[a] j = 137.6^\circ \text{ } \epsilon$.

As this bark and the former have been taken from different parts of the *same* tree, the difference of nearly 4 per cent. in the amount of the alkaloids is very instructive.

3.317 grammes of mixed alkaloids treated with ether yielded 1.072 gramme of alkaloids soluble in ether = 2.244 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{15.8}{1.072}$; $l = 100$ mm.; $\alpha^\circ = 10^\circ \text{ } \epsilon$, was $[a] j = 147.4^\circ \text{ } \epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{14.1}{1.174}$; $l = 100$ mm.; $\alpha^\circ = 13.5^\circ \text{ } \epsilon$, was $[a] j = 163.8^\circ \text{ } \epsilon$.

1.031 gramme of alkaloids soluble in ether yielded 1.035 gramme of herapathite = 0.585 gramme of quinine = 1.273 per cent.

No. 28.—Strong-growing seedling Cinchona from Welbeck; dark leaved.

50 grammes of dry bark yielded 3.367 grammes of mixed alkaloids=6.734 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{13}{0.663}$; $l=100$ mm.; $\alpha^\circ=7^\circ\epsilon$, was $[a]_j=137.2^\circ\epsilon$.

3.27 grammes of mixed alkaloids treated with ether yielded 1.296 gramme of alkaloids soluble in ether=2.67° per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{20}{1.296}$; $l=100$ mm.; $\alpha^\circ=8.5^\circ\epsilon$, was $[a]_j=131.1^\circ\epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{13}{1.132}$; $l=100$ mm.; $\alpha^\circ=12.5^\circ\epsilon$, was $[a]_j=143.5^\circ\epsilon$.

1.264 gramme of alkaloids soluble in ether yielded 1.395 gramme of herapathite=0.788 gramme of quinine=1.681 per cent.

No. 29.—Strong-growing seedling Cinchona from Welbeck; light leaved.

50 grammes of dry bark yielded 2.144 grammes of mixed alkaloids=4.288 per cent. The molecular rotation calculated from the observation $\frac{V}{p} = \frac{13}{0.642}$; $l=100$ mm.; $\alpha^\circ=6.5^\circ\epsilon$, was $[a]_j=131.6^\circ\epsilon$.

2.01 grammes of mixed alkaloids treated with ether yielded 0.975 gramme of alkaloids soluble in ether=2.03 per cent. The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{17.4}{0.975}$; $l=100$ mm.; $\alpha^\circ=7.5^\circ\epsilon$, was $[a]_j=133.8^\circ\epsilon$.

The molecular rotation of the alkaloids insoluble in ether, calculated from the observation $\frac{V}{p} = \frac{13}{0.792}$; $l=100$ mm.; $\alpha^\circ=10^\circ\epsilon$, was $[a]_j=164.1^\circ\epsilon$.

0.839 gramme of alkaloids soluble in ether yielded 0.589 gramme of herapathite=0.333 gramme of quinine=0.825 per cent.

No. 30.—*C. officinalis*. Prunings from Neddiwattum.

50 grammes of dry bark yielded 1.86 gramme of mixed alkaloids=3.72 per cent. 1.811 gramme of mixed alkaloids treated with ether yielded 1.605 gramme of alkaloids soluble in ether=3.297 per cent.

The molecular rotation, calculated from the observation $\frac{V}{p} = \frac{17}{1.605}$; $l=100$ mm.; $\alpha^\circ=16.5^\circ\epsilon$, was $[a]_j=180^\circ\epsilon$.

1.495 gramme of alkaloids soluble in ether yielded 2.085 grammes of herapathite=1.178 gramme of quinine=2.6 per cent.

Although the total amount of alkaloids in these prunings is not high, the relatively large amount of quinine seems very striking.

The author concludes this series of investigations by putting the results in a tabular form :—

Amount of Mixed Alkaloids and of Quinine contained in several specimens of Cinchona Bark grown under different conditions, by Mr. W. McIvor, at Ootacamund.

100 PARTS OF BARK, DRIED AT 100° C., CONTAIN :—

Number.	Mixed Alkaloids.	Molecular Rotation Lævogyre.	Molecular Rotation Dextrogyre.	Alkaloids soluble in ether.	Molecular Rotation Lævogyre.	Pure Quinine.	Crystallized Sulphate of Quinine.
C. Succirubra. { 8 A	10·86	84·5°	41·60	3·705	111·0°	0·793	1·067
8 B	10·40	78·0°		7·654	158·0°	4·653	6·204
9	9·154	78·2°		5·707	137·9°	2·754	3·672
20	10·67	41·3°		3·142	138·6°	1·413	1·884
21	8·696	43·6°		3·307	133·4°	1·382	1·843
22	8·176	36·0°		2·973	78·6°	1·185	1·580
23	10·37			4·193	125·7°	2·024	2·700
C. Pahudiana. { 24	2·51	98·7°		1·038	not determined.	0·032	
25 A	2·023	148·2°		1·324	180·4°	0·606	0·808
25 B	4·80	139·8°		2·362	not determined	0·783	1·044
C. Officinalis. { 26	10·86	164·8°		4·228	174·7°	2·804	3·738
27	6·944	137·6°		2·244	147·4°	1·273	1·697
28	6·734	137·2°		2·670	1131·1°	1·681	2·241
29	4·288	131·6°		2·080	133·8°	0·825	1·100
30	3·72	not determined.		3·297	180·0°	2·60	3·466

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NOTES AND FORMULÆ.

PART IV.

NOTES AND FORMULÆ.

Combinations of Phosphate of Iron. Dr. C. G. Polk. (*Druggists' Circular and Chemical Gazette*, Jan., 1874.) Phosphate of iron, though a most valuable preparation, has never found much favour in its officinal form. It is capable, however, of being combined so as to form some excellent chalybeate pills, for which the author recommends the following formulæ:—

℞ Ferri Phosphatis	5j.
Quiniæ Sulph.	5ss.
Ext. Ignatiæ Amaræ	gtt. v. M.

Divide in pills No. xxx. Take one three times a day.

℞ Ferri Phosphatis	℥ij.
Quiniæ Sulph.	℥j.
Ex. Belladonnæ Alcoholic.	grs. v.
Ex. Aconiti Alcoholic.	grs. iij.
Ex. Cannabis Indicæ	grs. x. M.

Divide in pills No. xx. One pill three times a day.

℞ Ferri Phosphatis	℥ij.
Quiniæ Sulph.	℥j.
Acid. Arseniosi	gr. j.
Morphiæ Sulph.	gr. j. M.

Divide in pills No. xx.

He next refers to the great therapeutic value of hypophosphite of iron, especially in combination with the hypophosphites of quinia and strychnia, and suggests the following formulæ:—

℞ Ferri Hypophosph.	grs. 192.
Quiniæ (alkaloid fresh).	grs. 96.
Strychniæ	grs. ij.
Acid. Hypophosph.	gr. j.
Syrupi, q. s.	℥xij.

Take the freshly precipitated hypophosphite of iron, the freshly precipitated quinia, and the strychnia, and add sufficient hypophosphorous acid to form a solution; mix it with sufficient syrup to

measure twelve ounces; bottle and carefully cork. This preparation is a very valuable tonic, and seems to me to be more important than any other combination of the hypophosphites. Mixed with equal parts of the syrup of soda and lime hypophosphites, its value seems to be greatly enhanced. Sometimes, combined in equal proportions with the syrup of the hypophosphite of manganese, it proves a powerful restorer of lost strength and vigour.

This formula has proved sometimes very satisfactory:—

R	Ferri Hypophosph.	. . . . .	℥ij.
	Manganesii Hypophosph.	. . . . .	℥j.
	Quiniae . . . . .	. . . . .	℥j.

Divide into twenty pills. Take one pill three times a day.

The following formulæ for combinations of phosphate of iron with the phosphates of quinia and strychnia, and phosphoric acid, are quoted and strongly recommended as stomachic tonics and nerve stimulants:—

R	Sulphate of Iron	grs. 800
	Phosphate of Sodium	grs. 1280
	Sulphate of Quinia	grs. 384
	Dilute Sulphuric Acid	q. s.
	Aqua Ammonia	q. s.
	Strychnia	grs. 10½
	Syrupy Phosphoric Acid	℥ij.
	Syrup sufficient to make	℥xxxij.

Dissolve the sulphate of iron in three ounces of boiling water, and the phosphate of sodium in six ounces of boiling water. Mix them, and wash the precipitated phosphate of iron until the washings cease to be affected by a solution of the chloride of barium. Dissolve the quinia sulphate and the strychnia in two ounces of water by aid of dilute sulphuric acid, and precipitate the alkaloids by slowly adding ammonia water, and carefully wash them. Rub the phosphate of iron, quinia, and strychnia with four ounces of water, add the syrupy phosphoric acid, and dissolve them. Then filter the solution into sufficient syrup to make 32 fluid ounces. In the formula published in the *Druggists' Circular* it is directed that the syrupy phosphoric acid be mixed in ℥ xvi. of distilled water, the iron, quinia, and strychnia dissolved in the solution, and ℥ xvij. and 5ij. of sugar added.

The formula here given produces rather a finer pharmaceutical product, and seems less impressible to atmospheric exposure. The formula given in the *Druggists' Circular*, however, will produce quite

satisfactory results and answer every purpose. Easton's formula, published originally in Aitken's "Practice of Medicine," and by some erroneously called Aitken's formula, is prepared thus:—

R	Sulphate of Iron	3v.
	Phosphate of Soda	3i.
	Quinia Sulphate	grs. 192
	Dilute Sulphuric Acid	sufficient
	Aqua Ammonia	sufficient
	Strychnia	grs. vj.
	White Sugar	3xiv.
	Dilute Phosphoric Acid	3xiv.

Dissolve the sulphate of iron in one ounce of boiling water, and the phosphate of soda in two ounces of boiling water. Mix them, and wash the precipitated phosphate of iron until the washings are nearly tasteless. Dissolve the sulphate of quinia in two ounces of water by the aid of dilute sulphuric acid, and precipitate the quinia by aqua ammonia, and carefully wash it. Dissolve the phosphate of iron and the quinia thus obtained, as also the strychnia, in the dilute phosphoric acid; then add the sugar, and dissolve the whole without heat.

This formula, the one having semi-official recognition, is somewhat defective, and precipitates the iron in a few weeks, so as to modify its therapeutical powers, and seriously impair its pharmaceutical beauty. The dilute phosphoric acid is not sufficient to dissolve the iron, quinia, strychnia, and sugar, and hold them in perfect solution; the amount of sugar is not sufficient to preserve the preparation from deterioration by age and atmospheric influences, while the preparation by the above formula seems to be free from these objections.

Being desirous of forming a concentrated syrup of much greater strength than the above, so as to be more convenient for use on the tented field, the author devised the following formula in 1864:—

R	Freshly precipitated Phosphate of Iron	grs. 600
	Quinia, freshly precipitated	grs. 96
	Strychnia	grs. iij.
	Syrupy Phosphoric Acid	f 3iv.
	Water	3xiv.
	Syrup (very dense), q. s. ad	f 3xij.

Mix the phosphate of iron, quinia, and strychnia in the syrupy phosphoric acid previously diluted with fourteen drachms of water, and dissolve them. Add sufficient syrup to measure twelve fluid

ounces, and bottle with a tight-fitting stopper, so as to exclude the air entirely.

Each drachm will represent above five grains of the ferrous phosphate, one grain of the quinia, and one thirty-second of a grain of strychnia phosphate. There are about three grains of free phosphoric acid and about ten grains in basic combination of the same. Although a good preparation for an army surgeon, it is rather too powerful for private practice.

In compliance with the wishes of several physicians, Mr. Theodore A. Polk, of Seaford, Delaware, prepares the syrup thus:—

R	Freshly precipitated Phosphate of Iron .	grs. 192
	Phosphate of Quinia	grs. 64
	Strychnia	grs. 2
	Dilute Phosphoric Acid	5x.
	Sugar	3vij.
	Essent. Tincture Orange	3ij.
	Oil of Cardamom	gtt. viij.

Dissolve the phosphates of iron, quinia, and strychnia in the dilute phosphoric acid. Rub the essential tincture of orange and oil of cardamom with the sugar. Mix all together, and dissolve without heat.

Then follow formulæ for syrup of lactate of iron and lime, and syrup of phosphate of iron, ammonia, quinia, and strychnia, of whose therapeutic value the author entertains a very high opinion.

Lacto-Phosphate of Iron and Lime.

R	Freshly precipitated Phosphate of Iron . . .	3ij.
	Syrupy Phosphoric Acid	5vj.
	Concentrated Lactic Acid	3ij.
	Freshly precipitated Phosphate of Lime . . .	3ij.
	Syrup of Orange Flowers, q. s.	3xij.

Add the phosphate of iron to the syrupy phosphoric acid, previously diluted with two ounces of the orange-flower syrup. Mix the phosphate of lime with the concentrated lactic acid, previously diluted with two ounces of orange-flower syrup, and dissolve. Lastly, mix the two solutions together, and add sufficient syrup to measure twelve ounces.

Of this preparation and its intrinsic merits the author speaks in glowing terms, and believes that it embodies curative powers unequalled in certain forms of debility. In convalescence from acute diseases it promises much. Phosphate of lime is well known to be an important element in the human organism, a real essential in the

phenomenon of life. The waste of phosphate of lime is very great during fevers and inflammations, and the depleted organism demands its restoration. The emaciated frame requires it in a more readily assimilable form than that in which it is contained in the various articles of food, and this very condition is excellently filled in the syrup of the lacto-phosphate of iron and lime. If given with an elixir of cinchona, its value would be greatly enhanced.

Syrup of the Phosphate of Iron and Ammonia. Heat phosphate of soda to redness. Take of the pyrophosphate of soda so obtained ʒij. Dissolve in one pint of water. Take of the sulphate of iron ʒiv. Dissolve in twelve ounces of water. Mix the solutions, collect, wash, and dry the precipitate at a gentle heat over a water-bath. Take of this precipitate ʒj., liq. ammoniæ ʒjss., water q. s. Dilute the ammonia water with an equal volume of distilled water, and rub it with the phosphate of iron in a mortar until the latter is dissolved. Then dilute to seven ounces, and preserve gentle heat until it is evaporated to six ounces, and add ten ounces of dense syrup. Each drachm contains four grains of the phosphate of iron with ammonium. The syrup is quite permanent and remarkably free from inky taste.

Syrupus Ferri et Ammonii cum Quinice et Strychnice Phosphati.

R.	Ferri Sulphatis Granulati	.	.	.	.	ʒvj.
	Sodii Phosphatis	.	.	.	.	ʒx.
	Acidi Phosphorici Anhyd.	.	.	.	.	ʒxiij.
	Acidi Nitrici, c. p.	.	.	.	.	ʒiij.
	Quinice Sulphatis	.	.	.	.	ʒj.
	Acidi Sulphurici Dil.	.	.	.	.	q. s.
	Aquæ Ammoniacæ Concent.	.	.	.	.	q. s.
	Strychnicæ Citratis	.	.	.	grs.	xijss.
	Sacchari Albi	.	.	.	.	ʒxxx.
	Aquæ Destillatæ, q. s.	.	.	.	.	ʒxlviij.

Prepare the anhydrous phosphoric acid by igniting phosphorus in dry oxygen. As soon as the combustion is completed, dissolve 12 ounces of the white anhydrous phosphoric acid in 16 ounces of distilled water; add the nitric acid, place on a sand-bath, and apply heat until the fumes of nitric acid cease to be evolved. Dissolve the sulphate of iron in 10 ounces of boiling water, and the phosphate of sodium in 20 ounces of boiling water. Mix the solutions, and carefully wash the magma until the washings are tasteless. Dissolve the quinia and the strychnia in four ounces of water, and precipitate the alkaloids by slowly adding a weak solution of am-

monia water, and carefully wash them. Add the phosphate of iron to six ounces of the solution of phosphoric acid, and apply gentle heat until dissolved. Dissolve the quinia and the strychnia in four ounces of the solution of phosphoric acid. Saturate the remaining solution of the phosphoric acid with the concentrated ammonia water. Lastly, add the solutions of the phosphate of iron, the alkaloïds, and the phosphate of ammonium together in a bottle of the capacity of three pints, introduce the sugar and sufficient water to complete the measure of 48 ounces.

Each drachm contains five grains of the phosphate of iron, six grains of the phosphate of ammonium, one and one-fourth grain of the phosphate of quinia, and one twenty-eighth of a grain of the phosphate of strychnia. If therapeutically inferior to the syrup of the phosphates of iron, quinia, and strychnia, as a tonic, the phosphate of ammonia adapts it to an especial range of diseases. The permanency of the syrup also entitles it to important consideration. This formula differs very much from one previously published, and seems to be a better one.

A formula for syrup of phosphate of iron with citrate of potash, and one for syrup of superphosphate of iron conclude the author's report, and are here subjoined:—

Syrup Phosphate of Iron with Potassic Citrate.

℞	Liq. Ferri Tersulphatis	.	.	.	.	℥viij.
	Sodii Phosph.	.	.	.	.	℥ix.
	Acidi Citrici	.	.	.	.	℥xiv.
	Potassii Bicarb.	.	.	.	.	q.s.
	Sacchar. Alb.	.	.	.	.	℥xiv.
	Aquæ	.	.	.	.	q.s.

Dissolve the phosphate of sodium in one pint of boiling water, and slowly add to the solution the tersulphate of iron, stirring slowly until the phosphate of iron is completely precipitated. Then wash it in a funnel, on a muslin filter, until the washings are tasteless. Saturate the citric acid dissolved in one ounce of boiling water with the bicarbonate of potassium, add to the iron, and apply gentle heat on a sand-bath until the iron phosphate is dissolved. If it is not dissolved readily, a small amount of citric acid may be added, which very promptly secures a perfect solution. Evaporate to ten ounces, add the sugar, and continue a gentle heat until the sugar is dissolved. Each drachm represents 15 grains of the citropotassic ferro-phosphate.

Syrup of the Superphosphate of Iron.

Dissolve four ounces of glacial phosphoric acid in six ounces of water, raise the temperature to the boiling point, and add sufficient freshly precipitated phosphate of iron to saturate the solution, then introduce sufficient syrup to make 32 fluid ounces. If it be desired to unite quinia alone, or with strychnia, add the freshly precipitated alkaloids in the proportion of one grain of quinia and one twenty-eighth of strychnia to each drachm, or 256 grains of the former and eight grains of the latter to an ounce of water, and rub them up with nine drachms of syrupy phosphoric acid. Add sufficient syrup to the iron to form 16 ounces, and sufficient syrup to the alkaloids to measure 16 ounces, and add the two syrups together. This forms a powerful tonic, seldom disagrees with the stomach, is entirely devoid of the slightest inky taste, and proves a very effective preparation. Unfortunately, it is very unstable, and deteriorates rapidly. This fault can be remedied by adding two ounces, instead of nine drachms, of syrupy phosphoric acid, but then it will have the faults of the concentrated ferrous syrups without their tonic power, in relative doses.

In Dr. Polk's opinion, the syrup of hypophosphite of iron, quinia, and strychnia, exceeds in its therapeutical value every other preparation mentioned in this report. It is not so perfect, however, in a pharmaceutical point of view, and an improved practical and economical mode of preparing it would be very desirable.

Emulsion of Cod-liver Oil. W. M. Rice, Jun. (*Amer. Journ. Pharm.*, 3rd series, xii. 530.) After a series of experiments made with the object of completely masking the unpleasant fishy taste and smell of cod-liver oil, the writer has perfected the following formula, which he recommends to his professional brethren:—

℞	Olei Morrhuæ	f 3viij.
	Tragacanth . . . . .	. 3j.
	Sacchar. alb. . . . .	. ʒiv.
	Olei Gaulther.	gtt. ix.
	Olei Sassafras	gt. j.
	Olei Amygdal. Amar.	gtt. x.
	Aquæ	f 3viij.

The tragacanth and sugar are to be dissolved in the water, and the mucilage strained. In this is to be incorporated, first the essential oils, and then the cod-liver oil. This makes an elegant-looking emulsion, not too thick, containing 50 per cent. of the oil, and of a rather pleasant taste and smell.

Many manufacturers combine the lactophosphate of lime, etc., with the cod-liver oil mixture; but as physicians often consider this decidedly objectionable in a medicine intended, as this is in most cases, for long continued use, the author has been induced to omit it. It can be added, however, by a slight modification of the above formula.

Syrupus Ferri Phosphatis. A. Willson. (*Pharm. Journ.*, 3rd series, iv., 974.)

The difficulty of preparing a syrup of phosphate of iron which could be preserved from alteration for a reasonable period, led the author to make some experiments upon the subject, resulting in his adoption of the following formula, which has proved to be eminently successful.

Prepare the ferrous phosphate in the usual manner, being very careful to wash it perfectly free from the acetic acid formed during the process. Dissolve the moist phosphate in 7 drachms of syrupy phosphoric acid (sp. gr. 1.500), instead of the $5\frac{1}{2}$ ounces of diluted phosphoric acid, as directed in the Pharmacopœia; when dissolved, add sufficient distilled water to make the solution measure $1\frac{1}{2}$ ounce, and keep in a well-stoppered bottle. One drachm of this solution added to 7 drachms of simple syrup, forms a syrup in every respect identical with that of the B.P.

The use of syrupy phosphoric acid will be found far more convenient than the old mode (Groves' process) of evaporating the diluted acid.

Glycerin has been strongly recommended as a substitute for sugar in this syrup; but, so made, it is frequently objected to by the patient, as not being so thick as usual; and as a liq. ferri phosph. prepared as above keeps well, its use is rendered quite unnecessary.

Tincture of Phosphorus. Dr. Ashburton Thompson. (*Practitioner*, Oct., 1873.)

℞ Phosphorus	1 grain.
Absolute Alcohol	5 drachms.
Glycerin	$1\frac{1}{2}$ ounce.
Spirit of Wine	2 drachms.
Spirit of Peppermint	2 scruples.

Let the phosphorus be dissolved in the alcohol with a little heat: at the same time warm the spirit and glycerin together. Mix the two solutions while hot, and add the spirit of peppermint on cooling. One drachm of this mixture contains one-twelfth of a grain of pure phosphorus. These ingredients form a mixture perfectly

bright and clear, possessing almost no phosphoric odour or taste, and of a high degree of stability, even under exposure to light. The amount of spirit gives it a burning taste, which may be sometimes objected to; but if the patient be warned of this, probably no further remark will be made about it. So far from causing offensive eructations, it seems to have a tendency to arrest existing flatulency.

Dr. Beaven's Preventative and Remedy for Cholera. (*Chic. Pharm.*, vi., 287.)

The Preventative.

R	Sulphite of Magnesia	5ij.
	Sulphurous Acid,	
	Water, of each	f 5ij.
	Tincture of Capsicum	f 5ss.

Misce et solve. Sig.: a teaspoonful night and morning.

The Remedy.

R	Sulphite of Magnesia	5ij.
	Sulphurous Acid,	
	Water, of each	f 5ij.
	Tincture of Capsicum	f 5ss.
	Sulphate of Morphia	gr. ij.

Misce et solve. Sig.: a teaspoonful every half-hour until relieved.

Professor Bevan bases his mode of treatment on the theory that the nature of the malady is germinative or zymotic in character, and the principle of this prophylaxy and treatment is simply an extension of anti-zymosis to the organism itself. After a somewhat extended and careful observation of the action of anti-zymotic medicines, he is satisfied that without detriment to the alimentary mucous membrane or the general organism, these remedies, according to the above given formulæ, can be administered to the patient with the best of results, in larger doses than have heretofore been prescribed by medical practitioners.

The sulphite of magnesia, if not kept in stock, may be prepared by dissolving equal parts of sulphite of soda and sulphate of magnesia, each separately, in about eight parts of water, mixing the two solutions, and allowing the mixture to crystallize. Instead of crystallizing, the mixture of the two solutions may also be concentrated by evaporation, when the sulphite of magnesia will be precipitated owing to its sparing solubility. It is then collected on a filter, washed, and dried.

A suggested Improvement in the Preparations known as "Syrups of Phosphates." John M. Broad, jun. (*Pharm. Journ.*, 3rd series, iv. 849.) With the view of improving the very unsatisfactory preparations known as "syrups of phosphates," the author suggests the use of equal parts of glycerin and of water in place of syrup, which tends to keep the phosphates in a better condition with less phosphoric acid. The taste, too, is preferable to that of the syrups, and the cost of preparing it is about the same. It will answer equally well with the iodide and bromide of iron. The following are the formulæ proposed.

Glycerin of Phosphate of Iron.

R	Phosphate of Iron	16 grs.
	Phosphoric Acid (Syrupy), sp. gr. 1.5	1 fl. drm.
	Glycerin and Water, eq. pt. ad	fl. ʒij.

Rub the phosphate of iron down with a little water and glycerin, add the acid, and filter into the rest of the glycerin and water. Precisely similar directions apply to the following formulæ:—

Glycerin of Phosphate of Manganese.

R	Phosphate of Manganese	16 grs.
	Syrupy Phosphoric Acid, sp. gr. 1.5	f ʒj.
	Glycerin and Water, eq. pt. ad	f ʒij.

Glycerin of Phosphates of Iron and Manganese.

R	Phosphate of Iron	12 grs.
	„ „ Manganese	8 grs.
	Syrupy Phosphoric Acid, sp. gr. 1.5	f ʒj.
	Glycerin and Water, eq. pt. ad	f ʒij.

Glycerin of Phosphates of Iron and Lime.

R	Phosphate of Iron	grs. 16
	„ „ Lime	grs. 32
	Syrupy Phosphoric Acid, sp. gr. 1.5	f ʒj.
	Glycerin and Water, eq. pt. ad	f ʒij.

Glycerin of Phosphate of Zinc.

R	Phosphate of Zinc	grs. 32
	Syrupy Phosphoric Acid, sp. gr. 1.5	ʒ 50
	Glycerin and Water, eq. pt. ad	f ʒij.

Glycerin of Phosphate of Quinine.

R. Phosphate of Quinine	grs. 16
Syrupy Phosphoric Acid, sp. gr. 1.5	m 20
Glycerin and Water, eq. pt. ad.	f 5ij.

Glycerin of Phosphates of Iron and Quinine.

R. Phosphate of Iron	grs. 32
„ „ Quinine	grs. 16
Syrupy Phosphoric Acid, sp. gr. 1.5	m 70
Glycerin and Water, eq. pt. ad.	f 5ij.

Glycerin of Phosphates of Quinine, Iron, and Strychnine.

R. Phosphate of Iron	grs. 32
„ „ Quinine	grs. 16
Strychnia (in crystals)	gr. ½
Syrupy Phosphoric Acid, sp. gr. 1.5	m 70
Glycerin and Water, eq. pt. ad.	f 5ij.

Glycerin of Phosphates of Iron and Strychnine.

R. Phosphate of Iron	grs. 32
Strychnia (in crystals)	gr. ½
Syrupy Phosphoric Acid, sp. gr. 1.5	m 70
Glycerin and Water, eq. pt. ad.	f 3ij.

A preparation, made according to one of these formulæ, remained unchanged after more than two months.

Parchment Paper. (*Journ. de Pharm. d'Anvers.*, xxix. 472.) In order to prepare this substance, unsized paper is immersed for five to twenty seconds, according to its thickness, in a mixture of one kilogram of concentrated sulphuric acid and 125 grams of water, in such a manner that the acid acts equally on all parts of the paper. When the acid has acted for a sufficient length of time, the paper is passed successively through cold water, dilute solution of ammonia, and again through cold water, after which it is dried. If dried too suddenly, the paper curls, and assumes a bad appearance. In order to avoid this, a roll of paper is passed by a machine worked by steam, first through a vessel containing sulphuric acid, then successively through water, solution of ammonia and water, and over a cylinder covered with cloth, on which part of the water is deposited. Having been thus partially dried, it is pressed and smoothed between polished and heated rollers.

Extractum Ipecacuanhæ Fluidum. Richard V. Mattison (*Amer. Journ. Pharm.*, 4th series, iii., 481.) When this extract is prepared and diluted with syrup, according to the present formula

of the U.S.P. (1870), the result is a turbid mixture, whose very unsatisfactory condition induced the author to institute a series of experiments, which resulted in the selection of the following formula:—Take 80 troy ounces of carefully selected ipecac root, grind to appropriate powder, and, after moistening thoroughly, pack firmly in a cylindrical glass percolator, allow to stand four days as directed, then, using the official menstruum, allow percolation to proceed slowly until the root is exhausted. To the percolate add ten fluid-ounces of glycerin, and evaporate at a temperature not exceeding 140° F. (if the temperature is allowed to rise higher, a gelatinous mass will result), until reduced to the measure of 55 fluid-ounces. Transfer this to a moistened filter, and allow to drain. To the soft mass remaining upon the filter, consisting of the peculiar substance usually called resin (though not so, properly speaking), water is added by means of a spritz, and the whole thoroughly washed until the filtrate measures 60 fluid-ounces. This causes a reprecipitation of the resinous substance which necessitates the refiltration of the filtrate. To this second filtrate 20 fluid-ounces of glycerin is added, and the whole well mixed.

This furnishes an extract containing in each pint two fluid-ounces less of glycerin than the official preparation, limpid, perfectly transparent, and one that can be mixed with syrup without turbidity.

Pill Coating. J. A. Cope. (*Pharm. Journ.*, 3rd series, iv., 953.) The following simple method proposed by the author has been found to give very satisfactory results, and to produce pills having an elegant appearance, which will bear comparison with the best now in the market.

The ingredients used are powdered French chalk, and thin mucilage of gum arabic—one part mucilage of the Pharmacopœia, and two parts distilled water, answers very well. The apparatus used may be found in any pharmacy, namely, a small evaporating basin, having a flat bottom, capacity eight or ten ounces; two covered gallipots, one holding four or six ounces, the other about double that size, and a pill-tray.

The pills to be coated should be of good consistence, not too hard, and rolled perfectly round, to ensure their being a good shape when finished. It is well to use French chalk in the place of starch-powder, when rolling them out.

Into the small gallipot put some of the chalk, and into the basin put as much mucilage as may be necessary to thoroughly moisten the quantity of pills to be coated (from six to six dozen pills may be

done conveniently at one operation). Next put in the pills, and shake them round horizontally until sufficiently moistened, then turn them into the pot containing the chalk, and shake them round so as to get well covered with powder; turn them on the pill tray, and allow to remain a short time, and lastly place them in the empty gallipot, and shake round, so as to polish them, and remove the superfluous powder.

To coat pills by this method occupies about the same time as to silver them; but for stock pills, which may have to be kept some time, it is better to repeat this process, taking care to have the first coating dry before a second is put on. This will be found to give them a firm, pearl-like exterior, which preserves the pills of good shape and consistence, and prevents any change that would be likely to occur through lengthened exposure to the atmosphere.

A few trials will suggest the best way of manipulating, and enable any one to produce a fair sample of coated pills.

Varnish for Pill Coating. J. Whitfield, F.C.S. (*Pharm. Journ.*, 3rd series, iv., 953.)

℞ Common Amber Resin	. . .	1 to 2 drachms.
Spirit of Turpentine	. . .	1 drachm.
Oil of Geranium	. . .	20 minims.
Absolute Alcohol	. . .	To make 1 ounce.

The oil of geranium may be omitted, or substituted by other essential oils at discretion. The pills should be made as hard as possible.

Formula for the Preparation of Bromide of Calcium. (*Journ. de Pharm. d'Anvers*, xxix., 444; from *Rép. de Pharm.*) To freshly prepared milk of lime, add bromine in small quantities, using an amount proportionate to the strength of bromide required, filter and evaporate the filtrate to dryness; calcine the residue, and introduce it as quickly as possible into dry flasks, as it is a very hygroscopic substance. The reactions which take place during the operation may be easily understood: the bromine unites with the calcium to form bromide and bromate of calcium, both of which are soluble, the undissolved lime is left on the filter, and the bromate is reduced to bromide by the calcination.

Thus prepared, this salt is completely soluble in water, and gives a slightly blue tint to red litmus paper, owing to a trace of lime which it retains.

Purification of Chloroform changed by Keeping. E. B. Shuttleworth. (*Rép. de Pharm.*) In order to purify chloroform which

through long keeping contains free chlorine or hydrochloric acid, the author recommends the addition, with stirring, of hyposulphite of sodium. After decantation the chloroform is washed several times, and filtered through paper in order to separate any traces of moisture. Thus treated, chloroform, although not pure, loses all disagreeable odour, and is quite fit for external application.

Aromatic Waters. Joseph P. Remington. (*Amer. Journ. Pharm.*, 3rd series, xii., 533.) This class of preparations has long found favour with physicians as a means of dissolving and administering such potent or disagreeable remedies as are readily soluble in water, and the increasing use of carbonate of magnesium in their manufacture (although probably not the best method), renders their preparation of easy accomplishment.

The first requisite is the selection of fresh essential oils. An aromatized water made from a stale terebinthinous oil is the worst advertisement a pharmacist can have; whilst, if a fresh oil is at hand, even an aromatized orange water can be made which will serve many good purposes. The writer has used an orange water made in the usual manner with considerable satisfaction, and a very useful simple elixir, resembling curaçoa cordial, may be made by taking of—

Aquæ Aurantii (3ij. in a pint)	. . .	f ʒjss.
Syrup. Simpl.	. . . . .	f ʒjss.
Eau de Cologne . . . . .	. . . . .	f ʒj.
Spt. Vini Gallici (opt.) . . . . .	. . . . .	f ʒss. M.

Some formulas for simple elixirs direct the essential oils to be mixed with the spirit, and then a certain proportion of sugar and water added and filtered. The great objection to those made in this way is that when such are used in prescriptions with water in combination (and they are generally used in this way), a separation of the excess of oil takes place, which renders the preparation unsightly.

A delicately flavoured syrup of citric acid may be made which will be clear and bright, not disfigure the sides of the bottle, nor have the harshness which the officinal article possesses.

To make this, double the quantity of fresh oil of lemon prescribed by the officinal formula should be rubbed up with a small quantity of carbonate of magnesium, a little water added, thrown on a filter, then followed by more water, sufficient to form with the sugar and citric acid the syrup of officinal strength.

Compound aromatic waters are readily made, containing caraway,

coriander, cinnamon, orange and orange-flower flavours, and form a means of preparing the host of elixirs that are now required:—

Clarification of Beer by Tannin. E. Brescius. (*Dingler's Polytechnisches Journal*.) To every 1000 litres of beer, about 140 grams of tannin dissolved in 0·75 litres of water are added, and the whole well mixed. After three or four days, one litre of a solution of isinglass containing 10 grams, or two litres of a solution of gelatine of the same strength are added. Complete clarification requires about a week.

Plastic Charcoal for Filters. B. Kletzinsky. (*Dingler's Polytechnisches Journal*.) The author considers the two following formulæ as the best:—

Coke	. . . . .	60 per cent.
Animal Charcoal	. . . . .	20 " "
Wood Charcoal	. . . . .	10 " "
Pipeclay	. . . . .	10 " "

Or,

Coke	. . . . .	10 per cent.
Animal Charcoal	. . . . .	30 " "
Wood Charcoal	. . . . .	20 " "
Asbestos, with short fibres	. . . . .	40 " "

With the exception of the asbestos, each of these ingredients is pulverized, passed through a sieve, and then worked into a paste with molasses. When a homogeneous mass has been obtained, it is to be moulded in forms, dried and calcined in a muffle, allowed to cool slowly, and the moulded pieces digested with dilute hydrochloric acid, in order to extract the soluble cinders. After washing and drying, the pieces are again heated to a dull red heat in a well-closed muffle. They are then ready for shaping into the required forms.

Transparent Cement. (*Journ. de Pharm. et de Chim.*) A very adhesive, transparent cement, which can be used for wood, porcelain, glass, marble, etc., is obtained by mixing together in a mortar two parts of nitrate of calcium, twenty-five parts of water, and twenty-five parts of gum arabic.

Detection of Artificial Colouring Matter in Wines. (*Journ. de Pharm. d'Anvers*, xxix., 503.) Dissolve a piece of caustic potash in a small quantity of the liquid to be experimented upon. If no deposit is formed, and the wine assumes a greenish shade, there is no artificial coloration.

A violet-coloured deposit indicates the presence of elder-berries or mulberries, a red one indicates the presence of beetroots or

Brazil-wood, red-violet that of logwood. If the deposit is blue-violet, privet-berries have been employed; and if it is a pale violet, the coloration is due to litums.

Extractum Aurantii Corticis Fluidum. Munroe Bond. (*Amer. Journ. Pharm.*, 4th series, iii., 582.) Owing to the highly aromatic and somewhat tonic properties which the rind of sweet oranges possesses, it is extensively used as an ingredient in the multiform tonics and elixirs which are in vogue and so popular at the present time.

As, however, no formula has yet been given by the U.S.P., the author has tried various different methods, with a view to ascertain the best way and most appropriate menstruum, and recommends the following formula, which furnishes a very satisfactory preparation.

R Sweet Orange Peel in moderately fine						
powder	.	.	.	.	.	3xvj.
Glycerin	.	.	.	.	.	f 3iij.
Alcohol, Water, each a sufficient quantity.						

Mix 14 fluid ounces of alcohol with two fluid ounces of glycerin; moisten the orange peel thoroughly with 12 fluid ounces of the mixture in a large wedgwood mortar, or any convenient vessel, and having covered it carefully, let it stand for 12 hours; then pack moderately firm in a suitable percolator, and proceed as directed in the officinal process for preparing fluid extracts. Finish the percolation with a mixture of two parts of alcohol and one part of water, reserving the first 14 fluid ounces: add one fluid ounce of glycerin to the remainder, carefully evaporate to two fluid ounces, and mix with the reserved portion.

The fluid extract prepared in this manner has a rich appearance, is permanent, and possesses all the aroma of the orange peel, if a fresh and good peel has been employed.

One fluid ounce added to 15 fluid ounces of simple syrup makes a stronger and better "syrupus aurantii corticis" than the officinal. The resulting syrup is entirely destitute of any opacity, and its mode of preparation is less troublesome than by the present formula, which is somewhat tedious.

Four fluid drachms of the fluid extract and a few drops of solution of citric acid, mixed with one pint of syrup, make a syrup unsurpassed in delicacy of flavour, and unfermentable, for use at the mineral water counter.

Bitter Wine of Iron. Charles L. Mitchell. (*Amer. Journ. Pharm.*, 4th series, iii. 483.) This preparation, so much in demand

amongst practitioners at the present time, is, when rightly made, a most elegant tonic and stimulant. As often sold, however, it is of an inky colour and taste, and quite repulsive to the patient. Taking advantage of the property which the hydrated sesquioxide of iron possesses, of removing the tannic acid from the different vegetable astringents and tonics, the author has succeeded in making a preparation which is handsome, efficient, and pleasant to the taste. The formula is as follows :—

R	Grd. Cinchona Calisaya	192 grs.
	„ Gentian Root	128 „
	Soluble Citrate of Iron	192 „
	Sherry Wine	13 f. oz.
	Brandy	1 „
	Alcohol	1 „
	Oil of Orange	12 minims.
	Sugar	2 ozs.
	Solution of Tersulphate of Iron	2 f. oz.
	Water of Ammonia	q. s.

Dissolve the oil of orange in the alcohol, and mix with the sherry wine and brandy. With this menstruum percolate the ground drugs, recovering 15 fluid ounces tincture by pouring on water. Dilute the iron solution with twice its bulk of water, and add ammonia until in slight excess. Wash the precipitate until the washings are tasteless, and drain thoroughly. Mix this precipitate with the percolated tincture, and allow to stand, shaking frequently, until a portion filtered off has a light yellow colour, and does not blacken with tincture of chloride of iron. Then filter, dissolve the citrate of iron and the sugar, and bring up the measure with a little water to 16 fluid ounces.

Each fluid ounce represents 12 grains cinchona calisaya, 8 grains gentian root, and 12 grains of soluble citrate of iron.

Examination of Ground Coffee. J. Müller. (*Zeitschrift f. analyt. Chem.*, 1873, 232; from *Arch. Pharm.*, 3rd series, i., 308.) An adulteration of coffee with roasted grain and other amylaceous substances may be detected by shaking a small quantity of the powder with a weak solution of caustic potash, filtering, diluting the filtrate with water, acidifying by HCl, and adding solution of iodine, when the blue coloration will be immediately produced.

A Vegetable Glue. (*Pharmaceutische Centralhalle*, 1873, 205.) The adhesiveness of gum arabic can be considerably increased by the addition of a solution of sulphate of alumina. A solution of two parts of the crystallized sulphate in 20 parts of water is added

to 250 parts (by weight) of mucilage. Such a mixture answers well, not only for paper and cardboard, but also for wood, and may therefore be applied in place of glue. Alum may be used instead of the sulphate of alumina, but the result in that case would be less satisfactory.

Cement for Marble and Alabaster. (*Polytechn. Notizblatt*, 1873.)

Ransome recommends a mixture of 12 parts of Portland cement, six parts of prepared chalk, six parts of fine sand, and sufficient solution of silicate of soda to form a semi-liquid paste. The pieces of marble or alabaster are coated with the paste, then joined together, and left at rest for 24 hours, by which time the cement will have sufficiently hardened. The application of heat is unnecessary.

Combination of Lime and Glycerin, and its Pharmaceutical Application. P. Carles. (*Pharm. Journ.*, 3rd series, iv., 550.) The recent publication of a note upon this subject has induced the author to put on record some experiments, the results of which were communicated orally to the Paris Société d'Emulation pour les Sciences Pharmaceutiques in 1871, but have not hitherto been published.

When distilled water is shaken with lime under normal circumstances it only dissolves 1.251 grams per litre; but this proportion is, however, singularly increased by the intervention of neutral bodies, such as the sugars. That glycerin also acts in the same manner was noticed by the author, and gave rise to the following experiments:—

Into a series of flasks of similar capacity were placed constant quantities of 100 grams of distilled water and 20 grams of pure lime, together with varying proportions of glycerin, 0, 50, 100, 200, 400, etc. The flasks were labelled, 1, 2, 3, 4, 5. After agitation of the mixture for some time at a temperature of 18° C. the quantity of lime passed into solution was estimated alkalimetrically, and found to be—

No. 1	1.251
„ 2	1.865
„ 3	2.583
„ 4	4.040
„ 5	6.569

Now if each of these numbers be reduced by 1.251, the coefficient of the solubility of lime in water, it will be found that an addition of 50 parts of glycerin to 1000 of water augments by nearly one-half the solubility of the lime, and that this solubility is doubled

by the addition of 100 parts of glycerin per litre. If the proportion of glycerin be raised beyond 200 parts the quantity of lime dissolved is still sensibly increased, but starting from that figure it is in proportion irregularly inverse to the quantity of glycerin added. It is the author's opinion that the combination of glycerin with lime, which is a true combination very soluble in water, is on the contrary slightly soluble in glycerin itself.

Commencing at experiment 5, it communicated to the liquor a more and more opaque appearance, and whilst the undissolved lime was precipitated rapidly or remained upon the filter, the glycerocalcic compound remained for a long time in suspension, or even passed through the paper. In short, the glycerinate of lime is formed in larger proportion as the quantity of glycerin is increased, but being less soluble in the latter than in water remains in suspension.

These solutions appear to the author to be susceptible to the following applications:—

(1) In a chemical point of view, since they remain unaltered during a long time, they might advantageously replace as alkaline liquors the changeable solutions of saccharated lime.

(2) Pharmaceutically, it would allow of the simplification of the preparation of the lime liniment, and yield a superior product. The Codex orders one part of oil of almonds and nine parts of lime water to be agitated together, and the separation of the soap which floats on the top. If, in the place of ordinary lime water, equal parts of almond oil and of lime water containing 10 per cent. of glycerin are simply agitated together, a consistent calcareous soap is produced, which, even after several weeks, loses none of its consistence or homogeneity.

(3) Considered therapeutically, the addition of the glycerin, which besides is produced in small quantity in the ordinary process, appears to constitute an excellent adjuvant.

Formulæ for Pepsin Preparations. Henry Biroth. (*Chic. Pharm.* vii., 53.) All formulæ for elixirs and other preparations containing pepsin, heretofore published in the various pharmaceutical journals, differ so greatly in regard to doses, as well as the mode of preparing, that the demand for *uniformity* and *simplicity* in these preparations has become quite necessary. Now, for the last two years I have been manufacturing pepsin, and consequently have paid much attention to the different preparations in which pepsin is used. The results are the following formulæ, which I submit to the pharmaceutical profession. They are based upon the dose of the remedies used

therein, and their simplicity is evident. Elixirs, etc., can be prepared according to these formulæ instantly, when prescribed or kept on hand, in the smallest quantities; they are elegant, palatable, and may be modified by the physician *ad lib.*

The dose for children is from a half to one *teaspoonful*; for adults, from a half to one *tablespoonful*.

Each *teaspoonful* contains, in grains—

Pepsin.	Iron.	Bismuth.	Quinine.	Strychnia.
2	1	$\frac{1}{2}$	$\frac{1}{4}$	$\gamma\frac{1}{2}s$

Each *tablespoonful* contains, in grains—

Pepsin.	Iron.	Bismuth.	Quinine.	Strychnia.
8	4	2	1	$\frac{3}{4}s$

Syrup of Pepsin.

Powdered Pepsin	. . . . .	256 grains.
Muriatic Acid	. . . . .	1 drachm.
Syrup Orange-flower Water	. . . . .	16 ounces.
Mix.		

Wine of Pepsin.

Powdered Pepsin	. . . . .	256 grains.
Muriatic Acid	. . . . .	1 drachm.
Sherry Wine	. . . . .	16 ounces.
Mix.		

Elixir of Pepsin.

Powdered Pepsin	. . . . .	256 grains.
Muriatic Acid	. . . . .	1 drachm.
Orange-flower Water	. . . . .	8 ounces.
Bitter Almond Water	. . . . .	2 "
Simple Syrup	. . . . .	2 "
Glycerin	. . . . .	2 "
Deodorized Alcohol	. . . . .	2 "
Mix.		

Elixir of Pepsin and Iron.

Elixir of Pepsin	. . . . .	16 ounces.
Citrate of Iron, soluble	. . . . .	128 grains.
Mix.		

Liquid Pepsin.

Powdered Pepsin	. . . . .	256 grains.
Muriatic Acid	. . . . .	1 drachm.
Glycerin	. . . . .	6 ounces.
Water	. . . . .	10 "
Mix.		

Aromatic Liquid Pepsin.

Powdered Pepsin	256 grains.
Muriatic Acid	1 drachm.
Glycerin	6 ounces.
Orange-flower Water	8 „
Bitter Almond Water	2 „
Mix.	

Elixir of Pepsin and Bismuth.

Elixir of Pepsin	16 ounces.
Ammonio-Citrate of Bismuth	64 grains.
Mix.	

Elixir of Pepsin and Quinine.

Elixir of Pepsin	16 ounces.
Sulphate of Quinine	32 grains.
Mix.	

Elixir of Pepsin, Iron, and Bismuth.

Elixir of Pepsin	16 ounces.
Citrate of Iron, soluble	128 grains.
Ammonio-Citrate of Bismuth	64 „
Mix.	

Elixir of Pepsin, Iron, and Quinine.

Elixir of Pepsin	16 ounces.
Citrate of Iron, soluble	128 grains.
Sulphate of Quinine	32 „
Mix.	

Elixir of Pepsin, Iron, Quinine, and Bismuth.

Elixir of Pepsin	16 ounces.
Citrate of Iron, soluble	128 grains.
Ammonio-Citrate Bismuth	64 „
Sulphate of Quinine	32 „
Mix.	

Elixir of Pepsin, Iron, Quinine, Bismuth, and Strychnia.

Elixir of Pepsin, Iron, Quinine, and Bismuth	16 ounces.
Sulphate of Strychnia	1 grain.
Mix.	

Remarks.—To obtain a good preparation, pepsin has to be treated with water and acid, allowing it to swell and dissolve; then filter, and add the other ingredients, alcohol last. The salts of iron and

bismuth should be perfectly soluble, otherwise a few grains of carbonate of ammonia are to be added when rubbed together.

Preparation of Pure Glucose. H. Schwarz. (*Journ. de Pharm. et de Chim.*, 1873, 248; from *Neues Jahrb. f. Pharm.*) A solution of sugar in alcohol of 80 per cent. is mixed with hydrochloric acid; the sugar becomes gradually converted into glucose, which deposits in a state of great purity.

Application of Boracic Acid in the Preparation of Varnishes. M. Morell. (*Journ. de Pharm. et de Chim.*, 1873, 341; from *Neues Jahrb. f. Pharm.*, 1873, 186.) A great number of varnishes are met with in commerce, which adhere with difficulty to metals, and become detached on the slightest pressure. This is more especially the case with the gold coloured varnishes. The addition of 0.5 gramme of boracic acid to 100 grammes of varnish will remedy this defect. A larger proportion of the acid would weaken the intensity of the coloration.

Test-Paper for Moisture. G. Smith. (*Archiv f. Pharm.*, 1873, 281; from *Journ. of Applied Chem.*) Strips of paper are soaked in a solution of chloride of cobalt mixed with a little common salt and gum arabic, and dried. In a dry atmosphere this paper is blue, but it changes towards red in proportion to the amount of moisture in the atmosphere to which it is exposed.

Pancreatic Emulsions of Solid Fats. Richard V. Mattison. (*Amer. Journ. Pharm.*, vi., 592 and 675.) The emulsion of solid fat is best prepared in the following manner:—

Take of the fresh pancreas of the pig, 100 pounds; lard purified, 80 pounds; water, six gallons.

Dissect off all the fat and other extraneous matter from the pancreas, and comminute finely. A sausage cutter, driven by steam, is one of the most complete pieces of machinery for this purpose. After coming from the cutter it is allowed to drop with the fat into a cylindrical hopper driven by the same power. Into this hopper the six gallons of water are allowed to trickle slowly until a perfect emulsion is formed. From the hopper the emulsion is transferred to the press, in which a strong twilled flannel bag is placed, which should be of two thicknesses of material, and the emulsion is thus rapidly separated from the membranous areolar tissue of the pancreas.

To this emulsion ether is added, and the mixture allowed to remain at rest, with occasional agitation, for a period of about 48 hours. For the above quantity, from 250 to 275 pounds of ether are required. At the end of this time the mixture separates into two

layers or strata, viz., an ethereal solution of pancreatized fat at the top, and an aqueous solution of the impurities of the lard, etc., at the bottom. This mixture is allowed to stand in a large cedar vat, which has glass plates inserted in the side to allow the operator to observe the point of separation between the ethereal and the watery stratum. Into the side of this vat, which should be tall and narrow at the top, like a precipitation jar, a number of wooden spigots are inserted, through which the ethereal solution of pancreatized fat is drawn off into a filtering apparatus, so arranged as to prevent the escape of the ether. (If allowed to stand long enough, a considerable portion will need no filtration). This filtered ethereal solution is transferred to a suitable still, and the ether distilled off with gentle heat. This is the most troublesome part of the process, as it requires a considerable length of time to free the fat from the last traces of ether unless the temperature is raised, which results in the decomposition of the emulsified fat.

The pancreatin seems to split up in some manner by heat, leaving the fat in the same condition as it was before, or at least its emulsifying power is very much impaired. At the same time, there is a peculiar sulphurous odour developed, reminding one of the presence of onions or garlic, or a trace of allyl sulphide or sulphhydrate.

After the fat has been freed from ether with due regard to the temperature, it is removed from the still, and to every 50 parts of this fat 75 parts of distilled water and 25 parts of alcohol are added, both being added very carefully; when all the water and alcohol has been taken up, enough of oil of cloves is added to impart a pleasant flavour.

From experiments made before the publication of my first article in December, 1873, I was led to suppose that, contrary to the views of eminent physiologists, pancreatin has no power of decomposing fat. These views were expressed at that time, and the following facts elucidated by the practical management of the above process will serve as further illustration of the facts there mentioned.

The first is that the pancreatized fat obtained by evaporation of the ethereal stratum before mentioned, when acted upon by plumbic oxide, yields lead plaster and glycerin. This certainly shows that the fatty acids are still held in combination with the oxide of glyceryl, although the fat be pancreatized and emulsified.

Second, the aqueous solution left after the decantation of the ethereal stratum contains no glycerin. This proves the absence of even partial saponification upon the mixing of the fat in the first instance with the pancreas.

A sample of the emulsion of solid fat, prepared as above, was presented to the late esteemed Professor Proctor, who regarded it with much favour, and spoke at length upon it in connection with a sample of pancreatic emulsion of cod-liver oil, both of which samples were exhibited to the class upon the evening of his death.

The emulsion prepared by this process should have an acid reaction to litmus paper, and should not separate upon standing. Much care is necessary in the manipulation to prevent this.

When added to a small quantity of water, and stirred until complete mixture is effected, the whole has the appearance of milk, and any quantity of water may be added without disturbing in the least the appearance of the emulsion.

A superior method of administering the emulsion is to add it, little by little, to milk; to those persons having an antipathy to milk, it is easily given in a mixture of arrowroot and water. This proves an excellent method, as the pancreatic emulsion, as well as the pancreatin itself, has a decided action upon amylaceous matter, changing it to glucose; hence it can be easily seen how important the administration of this in connection with arrowroot is in cases of marasmus and other infantile diseases arising from defective nutrition.

Ointment for Neuralgia. Dr. Bourdon. (*Journ. de Pharm. et de Chim.*, 1873, 41; from *Union méd.*)

R	Vegetable Wax	15 grammes.
	Sweet Oil of Almonds	5 „
	Lard	20 „
	Chloroform	12 „
	Acetate of Morphia	0·1 „

The wax and lard are melted, and mixed with the oil; the morphia and chloroform are then added, and the mixture stirred until it is quite cold.

Ethereal Tincture of Iodoform. MM. Odin and Leymarie. (*Rép. de Pharm.*, 1873, 350.) Dr. Gubler employs iodoform in ethereal solution as a topical application. Owing to the rapid volatilization of the solvent, this substance is left in a very finely divided state, so as to cover the skin in a uniform manner.

The authors have ascertained the most favourable conditions for the preparation of such a solution, and recommend the employment of crystallized iodoform, which is to be dissolved in four times its weight of ether of 60° Baumé, by simple agitation in a red glass flask.

The Preparation and Coating of Iodide of Iron Pills. M.

Magnes-Lahens. (*Journ. de Pharm. et de Chim.*, 1873, 328.) The following conditions are recommended for the preparation and conservation of iodide of iron pills:—

Very little water is to be used in the formation of iodide of iron, so that but little evaporation is required for producing the pill mass.

The filtration of the solution of iodide of iron is to be avoided, as this operation may involve loss and chemical change. The small excess of iron used is thus left in the pill mass, and serves to protect the iodide of iron from change.

Gum arabic and sugar are to be used in place of honey. The operation is to be conducted at 122°–144° F., and an iron dish should be used instead of glass or porcelain. (The use of an iron dish and the substitution of sugar for honey have been already adopted in the *B.P.*)

The following is the author's formula:—

R Pure Iodine	4.10 grammes.
Powdered Iron	1.90 „
Powdered Sugar	2.50 „
Powdered Gum Arabic	2.50 „
Distilled Water	2.50 „

Put in an iron dish the water and the powdered iron, add the iodine gradually, and facilitate the reaction by stirring with a spatula of iron and warming a little; when the reaction is complete, add the gum and the sugar, then heat to about 50° C., stirring continually, and until the mass will cease to drop, when a little is taken up with the end of the spatula. The mass is kept in this state, and when required for pills, five grammes of powdered liquorice root, or as much as required, are well mixed with it, the mixture gently heated for some minutes, and divided into 100 pills, which are rolled in the powdered gum, and, if desired, coated with mastic and tolu.

To obtain sugar-coated pills, the mass is mixed with 7.5 grammes of powdered gum arabic, softened by gentle heat, and divided into 100 pills, which are rolled in powdered gum arabic, heated, and agitated with a circular motion in a suitable vessel, until sufficiently hard, and then coated with sugar.

Each pill contains five centigrammes of pure and unchanged iodide of iron and one centigramme of metallic iron.

The author suggests the following method of coating:—

About 50 pills at a time are rolled quickly with the hand in a saucer moistened with mucilage of acacia, and then thrown into

a basin containing a mixture of one part of gum arabic and nine parts of sugar, with which they are agitated until they are covered with a layer of powder; heat is then applied very gradually for eight or ten minutes, during which the pills are kept rotating. When cold they may be coated a second and third time in the same manner.

Preparation of Artificial Alizarin. Meister Lucius and Brunig. (*Reimann's Farbenzeitung*, 1873, No. 20.) The authors recommend the following process for the conversion of anthracene into alizarin.

The anthracene is oxidized by a mixture of nitric acid and bichromate of potash, and the resulting anthraquinone treated with fuming nitric acid, in order to convert it into nitro-anthraquinone. This nitro compound is treated with an alkali, and the alizarin precipitated by the addition of an acid.

Alizarin from anthracene frequently differs in appearance from alizarin obtained from madder, the latter being mixed to a considerable extent with purpurin. According to the authors, the alizarin prepared by their process contains purpurin, and can therefore be used for the production of all the colorations obtained with madder.

Aqua Cinnamomi. F. W. Reinhold. (*Chic. Pharm.*, 1873, 325.) The author states that cinnamon water prepared from the oil by means of carbonate of magnesia, may be readily distinguished from the distilled article by the following test.

Add one or two ounces of the cinnamon water to one drop of tincture of perchloride of iron, and allow the mixture to stand for 15 minutes. If the cinnamon water was pure, it will form a bulky, yellowish white, flaky precipitate of ferric cinnamate; but if it was prepared with magnesia, a faint, reddish, flaky precipitate of ferric hydrate will be thrown down. This result shows that the magnesia completely removes the cinnamic acid as insoluble cinnamate of magnesia; and further, that the water is very perceptibly impregnated with the magnesian compound, as is shown by the precipitation of the iron solution.

Infusion of Wild Cherry Bark. J. B. Moore. (*Amer. Journ. Pharm.*, 4th series, vi., 242.) The infusion of wild cherry bark, made with water, according to the formula of the U. S. P., is a very unstable and unsatisfactory preparation, as water extracts but a small proportion of the bitter tonic principle of the drug. For this reason, the author recommends the use of glycerin mixed with water, and gives the following formula, which after repeated trials has proved very satisfactory.

- ℞ Powd. Wild Cherry Bark, No. 60 . . . ʒss. troy.
 Glycerin fʒij „
 Water, temp. 86°, Cold Water, each a sufficient quantity.

Moisten the bark with six fluid drachms of water of 86°, and allow the mixture to stand for two hours in an airtight vessel at about the same temperature; then pack it firmly in a glass percolator. Mix the glycerin with ten fluid-ounces of water of 86°; pour the mixture gradually upon the bark, and when it has passed through, continue the percolation with cold water until one pint of infusion is obtained.

As it is desirable in many cases of disease to combine the properties of tar with those of the wild cherry bark, the author recommends the following formula:—

- ℞ Pure Tar ʒss. 1 pint.
 Infusion of Wild Cherry Bark ʒss. 4 „

Macerate for three days, shaking frequently; then filter through paper.

This infusion is much less liable to spoil than the simple infusion of cherry bark, as it is impregnated with the antiseptic constituents of tar. Glycerin being a good solvent of the medicinal portion of tar, the author considers this preparation superior, in a medicinal point of view, to the wine of tar, and thinks that it might be substituted for the latter with advantage, in cases of pectoral disease.

Ointment for Prurigo. Dr. Girou de Buzareignes. (*Journ. de Pharm. et de Chim.*, 1874, 299; from *Union méd.*)

- ℞ Norwegian Tar 15 grammes.
 Laudanum (de Rousseau) 2 „
 Lard 60 „

This ointment is to be applied night and morning. After a few applications the itching ceases, and a complete cure is soon effected.

A new Mode of Preparing Infusion of Kousso. M. Grandon. (*Journ. de Pharm. et de Chim.*, 1874, 239; from *Journ. de Méd. et de Chir.*) The author recommends that 20 grammes of very finely powdered and sifted kousso be infused in 250 grammes of boiling water for 12 hours, after which the infusion is to be heated in a water-bath, very well stirred, and then administered to the patient along with the powder.

He relates a remarkable case in which this infusion, given in the dose mentioned, cured a man of seven tapeworms of various lengths,

which were discharged with their heads, an hour and a half after the administration of the medicine.

An Indelible Stamping Ink. Prof. Böttger. (*Repert. der Pharm.*, xxii., 433.) The author employs the black colouring matter contained in the fruit of *Anacardium orientale* for the preparation of an indelible stamping ink.

The coarsely powdered anacardium nuts are macerated in a well closed bottle with petroleum ether for some time. Upon allowing the latter to evaporate spontaneously a syrupy residue is left, and this, when applied to linen or cotton cloth, imparts to them a brownish yellow colour, which instantly changes to a deep black on the addition of ammonia or lime water. This colour withstands the action of solutions of chlorinated lime, cyanide of potassium, caustic potash, and mineral acids, without in the least losing in intensity.

Bleaching of Fatty Oils. C. Puscher. (*Vierteljahresschrift für Pract. Pharm.*, 1873, 601; from *Bayerisches Industrie und Gewerbeblatt*.) When 2 kilog. of a mixture of equal parts of alcohol of 96 per cent. and concentrated sulphuric acid are added to 100 kilog. of a fatty oil, the latter is not partially resinified (as is the case when sulphuric acid only is used), but a uniform mixture is obtained which soon turns green, and afterwards black. After a two days' rest this black substance deposits, and leaves the oil clear and pale. Rape oil and oil of poppy seeds thus become perfectly colourless; linseed oil still retains a very slight yellowish tint. After separating the oil from the black deposit, it must be washed with water to remove the acid.

Remedy for Chilblains. M. Rhien. (*Wittstein's Viertelj.*, 1873, 603.) Dissolve separately 30 grammes of tannin in 200 c.c. of water, and 3 grammes of iodine in 50 grammes of rectified spirit; mix the two solutions, and add sufficient water to make $1\frac{1}{2}$ litre.

This lotion is applied once a day, by heating it in a china vessel, and immersing the affected part as long as the slowly increased heat permits; the moisture adhering to the chilblains should not be wiped off, but allowed to dry before a fire. Four or five applications of this kind generally effect a complete cure.

Fluid Extract of Sumach Berries. Jos. P. Remington. (*Amer. Journ.*, 1874, 7.) There being no satisfactory formula for this valuable preparation, it occurred to the writer to try the Pharmacopœia process for the astringent fluid extracts, by which he obtained a rich, bright red liquid, possessing the virtues of the berries in a marked degree. The glycerin is a good solvent for the tannic and malic acids present.

The formula is as follows :—

R Sumach berries in moderately fine	
powder	16 troy ounces.
Glycerin	4 fluid ounces.
Alcohol, Water, each a sufficient quantity.	

Mix half a pint of alcohol, three fluid ounces glycerin and five fluid ounces of water, and, having moistened the sumach with four fluid ounces of the mixture, pack in a suitable percolator (Squibb's new percolator answers very well), pour on the top the remaining portion of the 16 fluid ounces of menstruum; close the percolator and allow the powder to macerate for four days; then open the percolator and continue the percolation until 24 fluid ounces have been obtained. Of these, reserve the first 14 fluid ounces, and evaporate the remainder to two fluid ounces, mix with the reserved portion, and filter, if necessary.

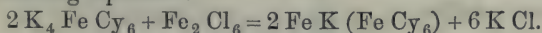
Like many other fluid extracts containing glycerin, a slight precipitation of colouring and extractive matter takes place when diluted with water. If considered desirable, the precipitate may be mixed with an equal quantity of water, and re-evaporated at a low temperature; but, as probably all of the prescriptions into which it would enter would require filtration, it is unnecessary.

A very good gargle and mouth wash may be made by taking—

Fld. Ext. Rhus Glab.	f ʒiv.
Potass. Chlorate	ʒij.
Glycerin, pure	ʒiv.
Water	ʒvij.

Filter.

Soluble Prussian Blue. M. Sergent. (*Journ. de Pharm. et de Chim.*, 1874, 227; from *Journ. de Corr. Méd.*) When a solution of a persalt of iron is precipitated by an excess of ferrocyanide of potassium, and the blue precipitate which is formed separated by filtration, and washed with water to remove the excess of the ferrocyanide of potassium, a beautiful blue solution is obtained, which forms no deposit upon standing. The reaction is represented by the following equation :—



The author gives the following proportions :—

1. Ferrocyanide of Potassium 10 grammes.
Distilled Water, sufficient to make 100 c.c. of solution.
2. Solution of Perchloride, of Iron,
containing 0.095 of Fe per gramme 14 grammes.
Distilled Water, sufficient to make 100 c.c. of solution.

Equal quantities of solutions 1 and 2 are used, and mixed with a sufficient quantity of water. The quantities given in the above formula are intended to make one litre of the preparation.

The soluble Prussian blue has been extensively employed for histological investigations, especially at the *clinique de la Charité*.

Gelatina Olei Jecoris Aselli. Dr. O. Th. Sandahl. (*Vierteljahresschrift f. Pract. Pharm.*, 1873, 603.)

℞ Cod-liver Oil	85 parts.
Isinglass	3 „
Sugar	8 „
Water	4 „

This mixture forms a semi-transparent jelly, which possesses the following advantages over cod-liver oil:—

1. It can be taken in the form of pills.
2. It remains sufficiently long in the stomach to ensure complete assimilation, which is not the case with the uncombined oil.

Formulæ for Elixirs. (*Chic. Pharm.*, 1874, 47.)

Simple Elixir.

℞ Spirit of Orange	$\frac{1}{2}$ fluid ounce.
Stronger Alcohol	4 fluid ounces.
Cinnamon Water	6 „ „
Syrup	6 „ „ Mix.

This is a turbid mixture. For many purposes it is not necessary to filter before using, but generally it should be clear, particularly when used for physicians' prescriptions, and in making some elixirs. Filtering-paper pulp, made by beating scraps of chemically pure filtering-paper in a mortar, in the proportion of 60 grains of paper to half fluid ounce of water, added to 16 fluid ounces of the elixir, agitated briskly for a few moments, and filtered, renders the elixir perfectly limpid. The paper is free from the chemical objections urged against carbonate of magnesium, chalk, etc., which are frequently used as clarifying agents.

The very pleasant taste and odour of this elixir, and its freedom from colour and chemical impurities, commend it for general use as a medicinal vehicle.

Red Elixir.

℞ Comp. Tincture of Cochineal	$\frac{1}{2}$ fluid ounce.
Simple Elixir	15 fluid ounces. Mix.

This is sometimes preferred as a simple elixir because of its beautiful colour.

Elixir of Calisaya Bark.

- ℞ Tinct. Cinchona, U.S.P., 1870 . . . 22 fluid drachms.
 Simple Elixir . . . sufficient to make 16 fluid ounces.

Mix and filter. This contains the virtues of two grains of Calisaya bark in one fluid drachm.

Elixir of Calisaya Bark with Iron.

- ℞ Elixir of Calisaya Bark . . . 15 fluid ounces.
 Warm Distilled Water . . . 1 fluid ounce.
 Citrate of Iron (soluble) . . . 128 grains.

Dissolve the iron in the warm water, and add the elixir. Filter if necessary. Each fluid drachm of the unfiltered elixir contains one grain of the iron salt, and the virtues of nearly two grains of Calisaya bark.

Compound Elixir of Cinchona.

- ℞ Compound Tinct. of Cinchona, U.S.P.,
 1870 . . . 22 fluid drachms.
 Simple Elixir . . . sufficient to make 16 fluid ounces.

Mix and filter. If not required for immediate use, this and also the Calisaya elixir should stand for about twelve hours before filtering.

Compound Elixir of Cinchona with Iron.

- ℞ Compound Elixir of Cinchona . . . 15 fluid ounces.
 Warm Distilled Water . . . 1 fluid ounce.
 Citrate of Iron (soluble) . . . 120 grains.

Mix. Proceed as for elixir of Calisaya with iron.

Elixir of Citrate of Iron.

- ℞ Citrate of Iron (soluble) . . . 256 grains.
 Warm Distilled Water . . . 1 fluid ounce.
 Simple Elixir . . . 15 fluid ounces.

Dissolve the iron in the warm water, and mix with simple elixir. Filter.

Elixir of Pyrophosphate of Iron.

- ℞ Pyrophosphate of Iron . . . 256 grains.
 Warm Distilled Water . . . 1 fluid ounce.
 Simple Elixir . . . 15 fluid ounces.

Make according to directions for elixir of citrate of iron.
 This is the same in medicinal strength as Professor Diehl's formula.

Elixir of Citrate of Bismuth.

℞ Citrate of Bismuth and Ammonium	256 grains.
Warm Distilled Water	4 fluid ounces.
Water of Ammonia (drop by drop)	sufficient.
Simple Elixir	sufficient to make 16 fluid ounces of finished elixir.

This is the same bismuth strength as Professor Diehl's formula, viz., two grains of citrate of bismuth and ammonium in each fluid drachm.

Elixir of Pepsin.

℞ Saccharated Pepsin, Scheffer's formula	256 grains.
Sherry Wine	14 fluid ounces.
Simple Syrup	2 fluid ounces.
Fluid Extract of Ginger	25 drops.

Dissolve the pepsin in the wine, and add the fluid extract of ginger previously mixed with the syrup. Filter if necessary. Contains two grains of pepsin to the fluid drachm.

Elixir of Valerianate of Ammonium.

℞ Valerianate of Ammonium in crystals	256 grains.
Compound Tinct. of Cochineal	$\frac{1}{2}$ fluid ounce.
Simple Elixir	15 $\frac{1}{2}$ fluid ounces.

Dissolve the valerianate of ammonium in two ounces of the simple elixir, and carefully add water of ammonia until the solution is exactly neutral to test-paper. Mix with the balance of simple elixir, and then add the compound tincture of cochineal.

This is the formula of Professor C. Lewis Diehl, with the exception of the simple elixir. Notwithstanding this preparation contains a larger quantity than usual of the valerianate of ammonium (two grains of the salt in each fluid drachm), yet its unpleasant taste and odour is effectually masked by the fragrance of the simple elixir.

Elixir of Valerianate of Ammonium with Quinia.

℞ Sulphate of Quinia	128 grains.
Elixir of Valerianate of Ammonium	16 fluid ounces.

Mix. Filter if necessary. Sulphate of quinia is soluble in elixir of valerianate of ammonium to twice the quantity here ordered.

Compound Elixir of Sumbul.

℞ Tincture of Sumbul (Brit. Ph., 1867)	4 fluid ounces.
Syrup	4 fluid ounces.
Compound Tincture of Cochineal	$\frac{1}{2}$ fluid ounce.
Elixir of Valerianate of Ammonium	8 fluid ounces. Mix.

The elixir is slightly turbid, owing to the resin of the sumbul, which, if filtered out, must lessen its medicinal powers. This is given as a type of *extemporaneous elixirs*, which should not be filtered, but dispensed with the direction, "*Shake the vial before pouring out each dose.*"

Elixir of Pyrophosphate of Iron, Quinia, and Strychnia.

This requires particular manipulation, which precludes the use of simple elixirs.

The following formula is recommended by Messrs. E. Scheffer and C. Lewis Diehl.

℞ Sulphate of Quinia	60 grains.
Strychnia	1 grain.
Citric Acid	5 grains.
Stronger Alcohol	3 fluid ounces.
Spirit of Orange	80 minims.
Syrup	6 fluid ounces.
Pyrophosphate of Iron	$\frac{1}{2}$ troy ounce.
Distilled Water	7 fluid ounces.
Water of Ammonia	sufficient quantity.

Triturate the sulphate of quinia, strychnia, and citric acid together, until minutely divided, then add the alcohol and spirit of orange. Warm the syrup slightly (to about 150° F.), and add to the turbid mixture, when, upon stirring, the mixture becomes clear. To this add the pyrophosphate of iron, previously dissolved in the distilled water, and finally, carefully add water of ammonia, drop by drop, until the elixir is perfectly neutral to test-paper; filter. The finished preparation has a greenish yellow colour, a pleasant flavour of orange, and is permanent."

Bitter Wine of Iron.

(James T. Shinn's formula, slightly modified.) We have had several years' experience with the following formula, and it has given entire satisfaction to prescriber, dispenser, and consumer.

℞ Sulphate of Cinchonia	45 grains.
Sulphate of Quinia	15 grains.
Citric Acid	60 grains.
Citrate of Iron (soluble)	240 grains.
Concentrated Tinc. Fresh Sweet	
Orange-peel	3 fluid ounces.
Distilled Water	3 fluid ounces.
Sherry Wine	8 fluid ounces.
Syrup	2 fluid ounces.

Dissolve the sulphates and citric acid in two ounces of the water, and the iron in the remaining ounce of water: mix the two solutions, and add the other ingredients, previously well mixed together.

The only change from the original formula is in the kind and quantity of orange flavour, for which we claim an improvement. See *Proceedings of American Pharmaceutical Association*, 1864, 234.

Elixir of Gentian with Iron.

R	Extract of Gentian	128 grains.
	Citrate of Iron, soluble	128 grains.
	Distilled Water	1 fluid ounce.
	Simple Elixir	15 fluid ounces.

Dissolve the extract and iron in the water, *warmed*, and add the simple elixir; filter.

Elixir of Bromide of Potassium.

R	Bromide of Potassium	640 grains.
	Red Elixir	16 fluid ounces. Mix.

This contains 5 grains of the salt in each fluid drachm, and is given as a type. The red elixir does not seem to answer for the elixir bromide of calcium; caramel is a more suitable colouring substance for the calcium elixir. We prefer the simple elixir in this case, and to use no colouring substance.

Adhesive Liquid for Parchment, Paper, and Cardboard. (*Pharmaceut. Zeitung*, xix., 424.) Milk is boiled with a small quantity of acetic acid to precipitate the casein, which, after being well washed with pure water, is dissolved in a cold saturated solution of borax. A thick, clear liquid is thus obtained, possessing great adhesiveness.

Thielemann's Drops for Cholera. (*Pharmaceut. Zeitung*, xix., 424.)

R	Tinct. Opii crocatæ	ʒi.
	Vin. Ipecac.	ʒij.
	Ess. Menth. Pip.	ʒij.
	Tinct. Valer. Æther.	ʒiv. Mix.

The ess. menth. pip. in this recipe is half the strength of the essence of the B.P.

Unguentum Plumbi Tannici. Th. Diez. (*Neues Jahrb. d. Pharm.*, xl., 91.) As the preparation of this ointment from oak bark, subacetate of lead, etc., according to the German Pharmacopœia requires much time, the author proposes the use of a corresponding quantity of dry tannate of lead, and suggests the following formula:—

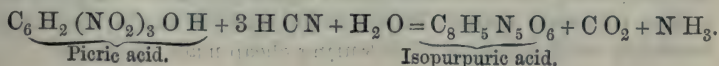
R. Plumbi Tannicei siccī	part. iij.
Amyli	part. j.
Tere ad pulv. subtiliss. ; tum adde	
Aquæ Dest.	part. vij.
Glycerin	part. v.
et calefac. in balneo vaporis ad glutinis consistentiam.	

Preparation of an excellent Black Writing Ink from Vanadate of Ammonia. Prof. Böttger. (*Polyt. Notizbl.*, 28, 287.) One part of pyrogallic acid, three parts of finely powdered gum arabic, and three parts of neutral vanadate of ammonia are mixed in a mortar, and a sufficient quantity of cold distilled water is added to the mixture. This ink is intensely black, and can be prepared in a very short time.

Boracic Acid as an Antiseptic. (*Pharmaceut. Zeitung*, xix., 320.) At a meeting of the German Sanitary Association, Mr. A. Müller drew attention to the extensive application of boracic acid in Sweden and other countries for the conservation of meat and milk. Meat which has been soaked in a solution of boracic acid for a few seconds, and milk to which a small quantity of the acid has been added, will keep much longer than they would do otherwise. The consumption of this antiseptic in Sweden alone amounted to £75,000's worth in one year.

The admissibility of such addition to articles of food in a sanitary point of view was also discussed at the the meeting, and opinions were expressed as to the harmless nature of boracic acid and its compounds.

Detection of Picric Acid in Beer. H. Brunner. (*Pharm. Post.*, 12.) The author suggests an improved method for the detection of picric acid in beer. A small quantity of white Berlin wool is heated in the beer acidulated by HCl on a water-bath for some time, in order to deposit the picric acid on the wool. As the yellow coloration of the wool may be rendered indistinct by the colouring extractive matter of the beer, the author recommends the separation of the acid from the wool by gently heating the latter with liquor ammoniæ, filtering, and evaporating the filtrate on a water-bath to a very small bulk. The addition of a few drops of solution of cyanide of potassium to the residue will produce a distinct red coloration if any picric acid is present. This red colour is due to isopurpurate of potassium, the formation of which is explained by the following equation—



The author succeeded in detecting one milligramme of picric acid in one kilogramme of beer by this process.

Detection of Caramel in Beer. Dr. R. Schuster. (*Neues Jahrbuch für Pharmacie*.) The dark colour frequently imparted to beer by the addition of burnt sugar may be recognized by shaking a sample of the beer with solution of tannic acid. Pure beer will be decolourized, but the colour of burnt sugar will remain.

Detection of Chicory in Boiled Coffee. (*Dingler's Polytechn. Journ.*, 211, 78.) The colour of an infusion of chicory remains unaltered on the addition of a solution of persulphate of iron, whilst the brown colouring matter of coffee turns green, and is partially precipitated in the shape of bluish green flakes. In an infusion containing both chicory and coffee, the ferric sulphate forms a precipitate, and leaves the liquid more or less brownish yellow. To accelerate the settling of the precipitate, the coloured liquid may be rendered slightly alkaline by ammonia.

A new Adulteration of Port Wine. E. B. Shuttleworth. (*Canadian Pharm. Journ.*, June, 1874.) Having recently had occasion to test a number of samples of port wine, the author principally directed his attention to the detection of foreign colouring matter as affording the best evidence of falsification. On applying the test recommended by Lapeyrere (*Journ. de Pharm. et de Chim.*), five out of the fourteen samples examined gave colorations differing from the remaining nine. This test appears to be of some value, but considerable experience seems to be required before a definite and satisfactory conclusion can be arrived at. Filtering paper is saturated with a solution of acetate of copper, dried, and dipped in the suspected wine. If genuine, a greyish rose-red colour is produced. Logwood is said to give a distinct sky-blue, while other colouring matters give modifications of the original natural tint.

On examining by the spectroscope the nine samples before alluded to, the spectra produced showed no special characteristics; and this would go to confirm the statements of Sorby (*Journ. of Microscopical Science*, vol. ix., 338) and Phipson (*Journ. of Chem. Soc.*, February, 1870), who found that the colouring matter of the grape shows no absorption bands, but only a general darkening of the spectrum. The five remaining samples of wine gave decidedly different spectra, one of which pointed to the presence of fuchsin.

A further examination by other tests confirmed this adulteration, and the author has since ascertained that a mixture of magenta and a blue colouring matter, known to the trade as azalin, are largely employed for the purpose of colouring cheap made-up wines.

In order to detect the adulteration, he has found the following method to be satisfactory, and very easy of application:—To a portion of the suspected wine, placed in a test-tube, add an equal volume of fusel oil; agitate well, and allow the mixture to separate, when, if magenta be present, the supernatant layer will assume more or less of a characteristic pink or purple colour. Genuine port, when so treated, does not impart to fusel oil any of its colour, so that the slightest coloration may be taken as a certain evidence of adulteration. If amylic alcohol be not at hand, ether may be substituted, but does not answer nearly so well.

Considering the dark colour which factitious port must be made to assume, and the large quantity of such wine which is frequently consumed at a time, it is evident that the presence of these poisonous colouring matters might produce serious results.

Improved Formula for Charta Sinapis. A. W. Gerrard. (*Pharm. Journ.*, 3rd series, iv., 889.) The formula given in the “Additions to the Pharmacopœia” for the preparation of mustard paper is unsatisfactory and expensive. The proportion of solution of gutta-percha necessary to render the ounce of mustard ordered sufficiently fluid for coating is ten drachms. This would contain more than a drachm of gutta-percha, which, when it is applied to the paper, and the chloroform has evaporated, gives the surface of the mustard a glossy, varnished appearance. In fact, the gutta-percha acts as a varnish, much retarding the absorption of moisture and the development of the essential oil upon which the activity of the paper depends. Another objection to gutta-percha is its insufficient adhesive power, for the coating cracks and peels from the paper after but slight handling.

With the object of remedying these objections, the author made a trial of a solution of indiarubber in benzol as a menstruum, judging from its physical properties that much less of this than of gutta-percha would be required to keep the particles of mustard cohesive, and that at the same time the action would be retarded only to a minimum degree. After several experiments to determine the most suitable proportions, he has adopted the following:—

R	Caoutchouc	.	.	.	.	.	.	1 part.
	Benzol	.	.	.	.	.	.	49 parts.
	Black Mustard, in powder, a sufficiency.							

Dissolve the caoutchouc in the benzol; then stir in the mustard till of a proper consistence for spreading on paper.

In this, as also in the B. P. form, the presence of the fixed oil in

the mustard gives the back of the paper a greasy appearance. Moreover, its removal, which might be effected either by pressure or by percolation with benzol, would be an advantage, not only as removing the cause of this greasiness, but it would render the mustard more active.

Papers spread with a mixture made according to the form here given have a dull, smooth surface, and the mustard adheres well together, although it contains only one-fourth as much indiarubber as the formula of the B.P. does of gutta-percha. The above preparation readily absorbs water and develops its activity. A piece applied to the arm gave evidence of its presence in less than two minutes, whilst a piece of the B.P. preparation required seven minutes, its full effect being comparatively slight. An estimate of the cost of the two forms shows that charta sinapis prepared as suggested above could be made at one-eighth the expense of the pharmacopœia preparation.

An excellent Freezing Mixture. (*Pharmaceut. Centralhalle*, xv., 24.) Sulphocyanide of potassium much exceeds nitrate of ammonium and other salts in the low degree of temperature produced while being treated with water. By stirring 500 grams of the sulphocyanide with 400 c.c. of water of $+10^{\circ}$ C. by means of a thermometer, the mercury in the latter will rapidly sink to -23° , showing a diminution of temperature of 35° . If the stirring be done with a test-tube half filled with water, the latter will completely solidify in about two minutes. The lowest temperature is obtained by using the salt and water in the proportions named; an excess of either water or sulphocyanide will interfere with the result.

TRANSACTIONS
OF THE
British Pharmaceutical Conference
AT THE
ELEVENTH ANNUAL MEETING
AT
LONDON.
1874.

EDITED BY
PROFESSOR ATTFIELD.

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British Pharmaceutical Conference.

CONSTITUTION.

Art. I. This Association shall be called The British Pharmaceutical Conference, and its objects shall be the following:—

1. To hold an annual Conference of those engaged in the practice, or interested in the advancement, of Pharmacy, with the view of promoting their friendly reunion, and increasing their facilities for the cultivation of Pharmaceutical Science.
2. To determine what questions in Pharmaceutical Science require investigation, and, when practicable, to allot them to individuals or committees to report thereon.
3. To maintain uncompromisingly the principle of Purity in Medicine.
4. To form a bond of union amongst the various associations established for the advancement of Pharmacy, by receiving from them delegates to the annual Conference.

Art. II.—Membership in the Conference shall not be considered as conferring any guarantee of professional competency.

RULES.

1. Any person desiring to become a member of the Conference, shall be nominated in writing by a member, and be balloted for at a general meeting of the members, two-thirds of the votes given being needful for his election. If the application be made during the recess, the Executive Committee may elect the candidate by a unanimous vote.

2. The subscription shall be 7s. 6d. annually, which shall be due in advance, upon July 1.

3. Any member whose subscription shall be more than two years in arrear, after written application, shall be liable to be removed from the list by the Executive Committee. Members may be expelled for improper conduct by a majority of three-fourths of those voting at a general meeting, provided that fourteen days' notice of such intention of expulsion has been sent by the Secretaries to each member of the Conference.

4. Every association established for the advancement of Pharmacy shall, during its recognition by the Conference, be entitled to send delegates to the annual meeting.

5. The Officers of the Conference shall be a President, four Vice-presidents by election, the past Presidents (who shall be Vice-presidents), a Treasurer, two General Secretaries, one Local Secretary, and nine other members, who shall collectively constitute the Executive Committee. Three members of the Executive Committee to retire annually by ballot, the remainder being eligible for re-election. They shall be elected at each annual meeting, by ballot of those present.

6. At each Conference, it shall be determined at what place and time to hold that of the next year.

7. Two members shall be elected by the Conference to audit the Treasurer's accounts, such audited accounts to be presented annually.

8. The Executive Committee shall present a report of proceedings annually.

9. These Rules shall not be altered except at an annual meeting of the members.

10. Reports on subjects entrusted to individuals or committees for investigation shall be presented to a future meeting of the Conference, whose property they shall become. All reports shall be presented to the Executive Committee at least fourteen days before the annual meeting.

*** Authors are specially requested to send the titles of their Papers to either of the General Secretaries two or three weeks before the Annual Meeting. The subjects will then be extensively advertised, and thus full interest will be secured.*

FORM OF NOMINATION.

I Nominate

(Name)

(Address)

as a Member of the British Pharmaceutical Conference.

..... Member.

Date

The nomination must be legibly written, and forwarded to one of the Honorary General Secretaries, Prof. ATTFIELD, 17, Bloomsbury Square, W.C., or F. BADEN BINGER, F.C.S., 7, Exchange Street, Royal Exchange, Manchester, either of whom, or any other officer or member, will duly sign the paper.

Pupils and Assistants, as well as Principals, are invited to become members.

HONORARY MEMBERS.

Professor P. Wendover Bedford, College of Pharmacy, New York City, U.S.A., Corresponding Secretary of the American Pharmaceutical Association, 278, Greenwich Street, New York.

Professor L. A. Buchner, Munich.

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Professor E. S. Wayne, Cincinnati, Ohio, U.S.A.

MEMBERS RESIDING ABROAD.

- Alexander, Mr. J. L., Bathurst, New South Wales (Letters, &c., Thirsk, Yorkshire).
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- Butterworth, Mr. H., Bathurst, New South Wales.
- Clark, Mr. W. L., Shanghai (Year-Book, etc., to Norton Villa, Midsomer Norton, Bath).
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- Hallawell, Mr. T., Rio Grande de Sul, Brazil (Letters, etc., to 10, College Lane, Liverpool).
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- Oxley, Mr. H. L., Palermo (Letters, &c., to Mr. C. S. Oxley, Calder Farm, Mirfield, Yorks).
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- Plimmer, Mr. W. T., L.H.C.L. Fort, Bombay (Letters, etc., to Messrs. Treacher & Co., 38a, King William Street, E.C.; Year-Book to Mrs. Plimmer, Uttoxeter, Staffs).
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- Romano, Mr. F., Palotas, Rio Grande de Sul, Brazil (Letters, etc., to Guy's Hospital, S.E.).
- Row, Mr. Warren Elfe, Balmain, Sydney, N.S.W. (Letters, etc., to Messrs. Johnson & Archer, 147, Fenchurch Street.)
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- Speechley, Mr. E., Karachi (Mr. J. D. Adcock, Alcester).
- Symes, Mr. E. W., Simla, N. India (Letters, etc., to M. Symes, 37, Church Street, Stoke Newington, N.).
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NOTICE.

Members will please report any inaccuracies in these lists to

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London, W.C.

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 Archer, Prof. T. C., Museum of Science and Art, Edinburgh.

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Armitage, Mr. G., Broomhill, Greenock, N.B.
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 Barron, Mr. W., 37, Winchcomb Street, Cheltenham.
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 Bell, Mr. T., Ambleside.
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 Bennett, Mr. S., Tunstall, North Staffs.
 Bennett, T. J., M.D., Wilton, Salisbury.
 Benson, J. L., Ph.D., Folly Hall, Beeston Hill, Leeds.
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 Berridge, Mr. A., Cheapside, Leicester.
 Berry, Mr. E., The Cross, Gloucester.
 Berry, Mr. T., Henshaw Street, Oldham.
 Berry, Mr. W. (Messrs. Hatch, Isaac & Co.), Redland, Bristol.
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 Black, Mr. J., Woodside, Cambuslang, N.B.
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 Blain, Mr. W., Market Street, Bolton.

- Blair, Mr. R. P., 230, South Street, Perth.
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Boorne, Mr. C., Union Street, Bristol.
Booth, Mr. J., 5, Darwen Street, Blackburn.
Booth, Mr. J., Elmfield, Rochdale.
Booth, Mr. J., Heckmondwike.
Booth, Mr. R., Parliament Row, Hanley.
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 Chambers, Mr. J., Eastwood, Notts.
 Chantler, Mr. R. P., Luton.
 Chaplin, Mr. J. L., Cornmarket, Wakefield, Yorks.
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 Cooper, Mr. M., Church, near Accrington.
 Cooper, Mr. T., Leicester.
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Hardwicke, Mr. E. J., 4, Meat Market, Bury St. Edmunds.
Hardy, Mr. S. C., 177, Regent Street, W.
Hargraves, Mr. H. L., 30, High Street, Oldham.
Hargreaves, Mr. J., 5, Bridge Street, Warrington.
Hargreaves, Mr. M., 108, Fylde Road, Preston, Lancs.
Hargreaves, Mr. R., Clithere.
Harland, Mr. T., Brick Lane, Bradford.
Harley, Mr. J., Crieff, N.B.
Harradine, Mr. H. G. (Mr. R. Newman), Bewdley.
Harrington, Mr. A., Needham Market, Suffolk.
Harrington, Mr. A. Needham Market, Suffolk.
Harris, Mr. E. R., 30, Richmond Place, Brighton.
Harris, Mr. H. W., 208, High Street, Rochester.
Harris, Mr. J., Eversham Street, Redditch.
Harris, Mr. J., 67, Wellington Road, Northampton.

- Harris, Mr. M. C. J., West Street, Crewkerne.
Harris, Mr. W. W., High Street, Highgate, N.
Harrison, G., Ph.D., 265, Glossop Road, Sheffield.
Harrison, Mr. J., 7, Central Beach, Blackpool.
Harrison, Mr. J., 33, Bridge Street, Sunderland.
Harrison, Mr. J., 42, Wicker, Sheffield.
Harrison, Mr. R., Farnworth, near Bolton.
Harrison, Mr. T., Sun Bridge, Bradford, Yorkshire.
Harrison, Mr. W. B., 6, Bridge Street, Sunderland.
Harrower, Mr. P., 136, Cowcaddens Street, Glasgow.
Hart, Mr. J., 131, Embden Street, Hulme, Manchester.
Hart, Mr. J., Newport Street, Bolton.
Hart, Mr. T., Bolton New Road, Atherton, near Manchester.
Hart, Mr. W., 99, Higher Bridge Street, Bolton.
Hartland, Mr. J., St. Augustine's Parade, Bristol.
Hartnoll, Mr. E. R., 7, Tichborne Street, Haymarket, W.
Hartshorn, Mr. A. F., Ironbridge, Shropshire.
Hartt, Mr. C., 11, Strand, Torquay.
Harvey, Mr. E., Giltspur Street, E.C.
Harvey, Mr. S., Canterbury.
Harvey, Mr. W. R., 98, Humberstone Road, Leicester.
Harvie, Mr. G., Princes Street, Helensburgh.
Harvie, Mr. J., Airdrie, N.B.
Harwood, Mr. E. G., 21, Newport Street, Bolton.
Haselden, A. F., F.L.S., 18, Conduit Street, W.
Haslett, Mr. J., Belfast.
Hasselby, Mr. T. J., 1, Baxtergate, Doncaster, Yorkshire.
Hatch, Mr. R. M., Claremont House, Redland, Bristol.
Hatfield, Mr. G. B., 318, Commercial Road, Limehouse, E.
Havill, Mr. P. W., 15, Fore Street, Tiverton, Devon.
Haworth, Mr. W., 162, Union Road, Busk, Oswaldtwistle, near Accrington.
Hawkin, Mr. J., Bedale, Yorks.
Hawkins, Mr. T., 32, Ludgate Hill, E.C.
Hay, Mr. D., Nelson-in-Marsden, Burnley.
Hayes, Mr. J., Great Warley, Essex.
Hayes, Mr. W., 12, Grafton Street, Dublin.
Hayhoe, Mr. W., Mr. Patman, White Lion Street, Norwich.
Hayles, Mr. B. H., Esplanade, Ealing, Middlesex.
Haynes, Mr. C. H., 103, Talbot Road, Bayswater, W.
Haythornthwaite, Mr. W., Kirkby Lonsdale, Westmoreland.
Hayton, Mr. P., High Street, Wigton, Cumberland.
Hayward, Mr. C. J., Lincoln.
Hayward, Mr. W. H., Trowbridge, Wilts.
Heald, Mr. B., Sleaford.
Heap, Mr. E., 149, Junction Road, Upper Holloway, N.
Heap, Mr. R., 98, Deansgate, Bolton.
Header, Mr. H. P., 24, Westwell Street, Plymouth.
Header, Mr. W., Rocombe, Torquay.
Heath, Mr. E. A., 114, Ebury Street, S.W.
Heathfield, W. E., F.C.S., F.R.S.E., 8, Wilson Street, Finsbury, E.C.
Heaton, Prof. C. W., F.C.S., Charing Cross Hospital, W.C.
Hebden, Mr. W. C., Northgate, Halifax.
Hedley, Mr. J., Houghton-le-Spring.
Hedley, Mr. T., 14, Market Place, Ramsbottom.
Heidfield, Mr. O., 41, Old Hall Street, Liverpool.
Helliard, Mr. E., Yeovil.
Hemingway, Mr. A., 20, Portman Street, W.
Hemingway, Mr. E., 20, Portman Street, W.
Hemingway, Mr. W., 20, Portman Street, W.
Henderson, Mr. C., Wibsey, near Bradford.

- Henderson, Mr. M. J., Main Street, Keswick.
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 Herring, Mr. H., 40, Aldersgate Street, E.C.
 Herington, Mr. J., Leighton Buzzard, Beds.
 Heppell, Mr. H.
 Hewitt, Mr. G., 13, Bull Ring, Kidderminster.
 Hewlett, Mr. C. J., Cree Church Lane, E.C.
 Hey, Mr. D., Hebden Bridge, Yorks.
 Heywood, J. S. C., F.C.S., 13, Hanover Terrace, Notting Hill, W.
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 Hibbert, Mr. W., Neath.
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 Hick, Mr. J., 3, Broadstones, Bradford.
 Hickey, Mr. E. L., 199, King's Road, Chelsea, S.W.
 Hickin, Mr. H., Mardol Head, Shrewsbury.
 Hickman, Mr. W., Archer Street, Kensington Park, W.
 Higgins, Mr. W., 142, Bridge Street West, Chester.
 Higgins, Mr. W., Farnham, Surrey.
 Highway, Mr. H., Beaconsfield, Walsall.
 Hilder, R. T., M.D., Grove Lodge, Balham, S.W.
 Hilditch, Mr. T., 96, Tipping Street, Ardwick, Manchester.
 Hill, Mr. A., 14, Oxford Street, South Heigham, Norwich.
 Hill, Mr. A. B., 11, Little Britain, E.C.
 Hill, Mr. F. (Messrs. Hirst & Co.), Aire Street, Leeds.
 Hill, Mr. J., 1, Castle Street, Reading.
 Hill, Mr. W.
 Hill, Mr. W. G., 58, George Street, Edinburgh.
 Hillidge, Mr. G., 140, Friargate, Preston.
 Hillier, Mr. H., Plough Court, Lombard Street, E.C.
 Hills, Mr. H. W., 2, Etloe Terrace, Carlisle Road, Leyton, Essex.
 Hills, T. H., F.C.S., 338, Oxford Street, W.
 Hills, Mr. W., 338, Oxford Street, W.
 Hinchliffe, Mr. F. G. U., 77, Portland Street, Manchester.
 Hinds, Mr. H. D., Pontardulais, Carmarthenshire.
 Hind, Mr. T. W. L., Kendal.
 Hinds, Mr. J., Coventry.
 Hinds, Mr. W., Coventry.
 Hindsley, Mr. H., London Institution, Finsbury Circus, E.C.
 Hingston, Mr. A. H., 58, Bold St., Liverpool.
 Hirst, Mr. J., 17, Old Street, Ashton-under-Lyme.
 Hiscock, Mr. R., 17, Broadgate, Coventry.
 Histed, Mr. E., 2, Upper Street, James's Street, Brighton.
 Hitchcock, Mr. C. E., 101, High Street, Oxford.
 Hitchin, Mr. R., 42, St. James' Street, Burnley.
 Hitchman, Mr. H., Market Place, Kettering.
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 Hobbs, Mr. D., 44, Bridge Street, Cambridge.
 Hobson, Mr. C., Beverley.
 Hobson, Mr. H., 64, Upper Rushall Street, Walsall.
 Hocken, Mr. J., 31, Old Hall Street, Liverpool.
 Hodge, Mr. J., 249, Overgate, Dundee.
 Hodges, Mr. W., Eastgate Row, Chester.
 Hodgeton, Mr. D., Brechin, N.B.
 Hodgkinson, Mr. C., 127, Aldersgate Street, E.C.
 Hodgkinson, Mr. G., 11, Cross Cheaping, Coventry.
 Hodgkinson, Mr. J. S., Matlock Bridge.
 Hodgkinson, Mr. W., 127, Aldersgate Street, E.C.
 Hodgson, Mr. W., 1, Market Place, Manchester.
 Hodgkinson, Mr. J., Mill Street, Macclesfield.
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 Hogg, Mr. R., 9, Albion Place, Hyde Park Square, W.
 Holden, Mr. R., 30, Pavement, York.
 Holdsworth, Mr. T. W., 28, Upper Priory, Old Square, Birmingham.
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 Holland, Mr. E., Irlams o' the Height, Pendlebury, Manchester.
 Holliday, Mr. T., Meyrick House, Hill Top, West Bromwich.
 Hollinworth, Mr. W., Birch Vale, near Stockport.
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 Holmes, Mr. F. G., Brill.
 Holmes, Mr. J., 92, Meadow Lane, Leeds.
 Holmes, Mr. J. T., 30, Upper Baggot Street, Dublin.
 Holmes, Mr. N. W. (Mr. Cruse), Southsea.
 Holmes, Mr. T., 349, Blackburn Road, Bolton.
 Holmes, Mr. W. M., 338, Oxford Street, W.
 Holstead, Mr. T., St. Helen's Road, Daubhill, Bolton.
 Holt, Mr. H., 36, Regent Road, Salford.
 Holt, Mr. S., 164, West Derby Road, Liverpool.
 Hooper, Mr. B., 43, King William Street, E.C.
 Hope, Mr. W., Uppingham.
 Hopkin, Mr. W. K., 16, Cross Street, Hatton Garden, E.C.
 Hopkinson, Mr. T., Grantham.
 Hopton, Mr. E., Idle, Yorks.
 Hopwood, Mr. T. S., Richmond, Surrey.
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 Horncastle, Mr. H., 54, Foregate, Sheffield.
 Horncastle, Mr. J., 17, Craven Road, Westbourne Terrace, W.
 Horner, Mr. E., 20, Bucklersbury, E.C.
 Horner, Mr. E., jun., 20, Bucklersbury, E.C.
 Horner, Mr. J. T., 20, Bucklersbury, E.C.
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 Horsfield, Mr. J. N., Sweet Street, Leeds.
 Horsley, J., F.C.S., The Laboratory, Police Station, Cheltenham.
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 Hothersall, Mr. J., 25, Standishgate, Wigan.
 Houghton, Mr. T., St. Clements, Oxford.
 Houghton, Mr. W., 100, Fishergate, Preston.
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 Howard, D., F.C.S., Stratford, E.
 Howard, Mr. J. E., Tottenham, N.
 Howard, Mr. W. D., Stratford, E.
 Howden, Mr. R., 78, Gracechurch Street, E.C.
 Howe, Mr. O. J., 20, Boundary Road, N.W.
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 Howie, Mr. W., 8, East London Street, Edinboro.
 Howlett, Mr. W. H., 30, Longsmith Street, Gloucester.
 Howman, Mr. P., Winchcombe.
 Howorth, Mr. J., Market Place, Doncaster.
 Hucklebridge, Mr. J. M., 116, Ebury Street, S.W.
 Huggins, Mr. J., Alresford, Hants.
 Huggins, Mr. W. H., Clapton Villa, Sandown, I.W.
 Hughes, Mr. C. G., Cateaton Street, Manchester.
 Hughes, Mr. F. R., Borrowstowness, N.B.
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 Hughes, Mr. E., 7, Bridge Street, Llanelly, Carmarthenshire.
 Hughes, Mr. E. G., 32, Victoria Street, Manchester.

- Hughes, Mr. H., 6, Bridge Street, Bridgnorth.
 Hughes, Mr. H. M., St. David's.
 Hughes, Mr. J. T., Ivy Bank House, 40, Church Street, Altrincham.
 Hughes, Mr. L. S., 40, Aldersgate Street, E.C.
 Hughes, Mr. R., Llangefni, county of Anglesey.
 Hughes, Mr. R., 353, Park Road, Liverpool.
 Hughes, Mr. S., High Street, Stourbridge.
 Hughes, Mr. T., Red House, Llandilo, South Wales.
 Hughes, Mr. W., junr., Presteign, Radnorshire.
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 Humpage, Mr. B., Turnham Green, W.
 Humphries, Mr. C., Garston, Liverpool.
 Hunt, Mr. A., 17, Bloomsbury Square, W.C.
 Hunt, Mr. L., 2, Albert Bridge, Manchester.
 Hunt, Mr. C., 29, Chapel Street, Belgrave Square, S.W.
 Hunt, Mr. R., 45, High Street, Winchester.
 Hunt, Mr. T., Workhouse, Liverpool.
 Hunter, Mr. F. N., 39, Saddler Street, Durham.
 Hunter, Mr. G., Withernsea, Yorks.
 Hunter, Mr. H., 71, Market Place, Whitehaven, Cumberland.
 Hunter, Mr. H., Clayport Street, Alnwick.
 Hunter, Mr. J. C., 118, Crown Street, Glasgow.
 Hurst, Mr. J., 27, Bottomoth Moor, Oldham.
 Hurst, Mr. J. B., Louth.
 Husband, Mr. M., 95, Fore Street, Exeter.
 Huskisson, Mr. H. O., Swinton Street, Gray's Inn Road, W.C.
 Hutchins, Mr. C., Wind Street, Neath.
 Hutchinson, Mr. J., 6, Spring Gardens, Buxton, Derbyshire.
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 Iliffe, Mr. T. P., Nuneaton.
 Illingworth, Mr. W. H., 12, Gladstone Road, Halifax.
 Imrie, Mr. D., 48, Front Street, Consett, Durham.
 Ince, J., F.L.S., F.C.S., F.R.M.S., 29, St. Stephen's Rd., Shepherd's Bush.
 Ingall, Mr. J., Ashford, Kent.
 Ingham, Mr. J., Upper Tooting, S.W.
 Inglis, Mr. H., 211, Every Street, Manchester.
 Iredale, Mr. G., 171, York Street, Leeds.
 Iredale, Mr. T., 129, North Street, Leeds.
 Irish, Mr. T. C., Southgate, Middlesex.
 Ismay, Mr. J., Groat Market, Newcastle-on-Tyne.
 Ismay, Mr. J. G., Groat Market, Newcastle-on-Tyne.
 Ison, Mr. F.
 Ive, Mr. W., 2, Stanhope Terrace, South Kensington, W.
 Izod, Mr. J., Church Road, Upper Norwood, S.E.

 Jaap, Mr. J., 268, Buchanan Street, Glasgow.
 Jack, Mr. G., 98, King Street, Dundee.
 Jacks, Mr. E., 161, Gower Street, W.C.
 Jackson, Mr. A. H., 43, Gt. Ducie Street, Strangeways, Manchester.
 Jackson, Mr. C., Church Road, Acton, W.
 Jackson, Mr. F. J., Bawtry.
 Jackson, Mr. G., 759, Rochdale Road, Harpurhey, Manchester.
 Jackson, Mr. J., Blackpool, Lancs.
 Jackson, Mr. J., 28, Maunville Terrace, Bradford.
 Jackson, Mr. J., York Street, Heywood.

- Jackson, Mr. J. H., Finkle Street, Stockton-on-Tees.
 Jackson, Mr. J. P., 6, Millbank Street, S.W.
 Jackson, Mr. J. T., Middleton Road, Chadderton, Oldham.
 Jackson, Mr. R., 2, Clegg Street, Oldham.
 Jackson, Mr. R., 35, Drury Hill, Nottingham.
 Jackson, Mr. W., Crediton, Devon.
 Jackson, Mr. W., Mansfield.
 James, Mr. J. T., 15, Princes Street, Hanover Square, W.
 Jefferson, Mr. P., Meadow Lane, Leeds.
 Jefferson, Mr. T., Church Street, Lower Edmonton, N.
 Jeffrey, Mr. G., High Street, Tring, Herts.
 Jeffrey, Mr. T. A., 1, Leamington Place, Cheltenham.
 Jeffries, Mr. H., 23, High Street, Guildford.
 Jenkins, Mr. J., Nottingham.
 Jenkins, Mr. J. T., Denhan Street, New Radford, Nottingham.
 Jenkinson, Mr. J. H. D., 46, Duke Street, Sheffield.
 Jenner, Mr. C. S., Westgate Street, Bury St. Edmunds.
 Jessop, Mr. J., Corn Market, Halifax.
 Jewell, Mr. R. J., 86, New Bond Street, London, W.
 Job, Mr. C. F., Market Place, Wakefield.
 Jobson, Mr. R., 125, Scotswood Road, Newcastle-on-Tyne.
 John, Mr. D. W., Pembroke.
 John, Mr. W. D., 104, Bute Street, Cardiff.
 Johns, Mr. T. J. R., 8, Cumberland Street, Devonport.
 Johnson, Mr. A. E., 338, St. Vincent's Street, Glasgow.
 Johnson, Mr. A., 20, High Street, Rotherham.
 Johnson, C., F.R.C.S., L.A.C., Castle Park, Lancaster.
 Johnson, Mr. F., Prestwich, near Manchester.
 Johnson, Mr. J., 8, Brondesbury Terrace, Kilburn, N.W.
 Johnson, Mr. J. H., 7, Church Street, Liverpool.
 Johnson, Mr. J. B., Uttoxeter.
 Johnson, Mr. M., Huyton, Liverpool.
 Johnson, Mr. M., Oakenshaw, Clayton-le-Moors.
 Johnson, Mr. R. A., 45, Westbourne Grove, W.
 Johnson, Mr. S. E., Ashby-de-la-Zouch.
 Johnson, Mr. T., 80, Walgate, Wigan.
 Johnson, Mr. T. S., 75, Bury New Road, Manchester.
 Johnson, Mr. W., 4, Derby Street, Leek, Staffordshire.
 Johnstone, Mr. W., Cromarty, N.B.
 Jolley, Mr. J., 18, Ivegate, Bradford.
 Jones, Mr. A. M., King Street, Brynmawr, Breconshire.
 Jones, Mr. C., Bridge Street, Birkenhead.
 Jones, Mr. C., 7, Market Square, Hanley.
 Jones, Mr. E. B., Lamas Street, Carmarthen.
 Jones, Mr. E. H., Monmow Street, Monmouth.
 Jones, Mr. E. P., Rhyl.
 Jones, Mr. F., 83, Oxford Street, Liverpool.
 Jones, Mr. G. W., 82, Bridge Street, Worksop.
 Jones, Mr. H., Llangollen.
 Jones, Mr. H. S., 139, Fulham Road, S.W.
 Jones, Mr. J., 60, Chester Road, Hulme, Manchester.
 Jones, Mr. J., 27, Station Road, Hadfield.
 Jones, Mr. J. A., 74, Hagley Road, Edgbaston, Birmingham.
 Jones, Mr. J. H., 9, Finsbury Place North, E.C.
 Jones, Mr. J. P., 2, Bridge Street, Aberayron.
 Jones, Mr. John, Market Place, Llanrwst.
 Jones, Mr. J. T., Bute Road, Bute Town, Cardiff.
 Jones, Mr. K. A., Connah's Quay, Flintshire.
 Jones, Mr. M., Flint.
 Jones, Mr. M. H., Villiers Street, Britton Ferry.

Jones, Mr. O. L., Bettws-y-Coed, Carnarvonshire.
 Jones, Mr. R., 126, Bridge Street, Chester.
 Jones, Mr. R. G., Commercial Place, Lye, Stourbridge.
 Jones, Mr. R. T., Hirwain, Glamorganshire.
 Jones, Mr. S. U., 4, Upper Parade, Leamington.
 Jones, T., F.G.S., F.R.A.S., Brunswick Villas, Shooter's Hill, Kent.
 Jones, Mr. T. P., 33, Broad Street, Welchpool.
 Jones, Mr. W., 157, Great Howard Street, Liverpool.
 Jones, Mr. W. C., 23, Bayswater Terrace, Bayswater, W.
 Judson, Mr. B. R. G., Castle Hill, Maidenhead, Berks.

Kaye, Mr. H., Berry Brow, Huddersfield.
 Kearnes, Mr. R. H., Swan Bank, Bilston.
 Keen, Mr. B., 11, George Street, Bath.
 Keene, Mr. E., 143, New Bond Street, W.
 Keene, Mr. J., 74, New Bond Street, W.
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 Kemble, Mr. J., Lostwithiel, Cornwall.
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 Kemp, Mr. J., Cullen, Banffshire.
 Kemp, Mr. J., 11, North Street, Brighton.
 Kendall, Mr. F., Stratford-on-Avon.
 Kennedy, Mr. W., Irongate, Glasgow.
 Kent, Mr. G. F., Shirehampton, Bristol.
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 Kerfoot, Mr. T., 113, London Road, Manchester.
 Kernot, G. C., M.D., 5, Elphinstone Road, Hastings.
 Kerr, Mr. C., 56, Nethergate, Dundee.
 Kershaw, Mr. J., Neville Street, Southport.
 Keyworth, Mr. G. A., Hadleigh House, Hastings.
 Kimberley, Mr. W., 22, Balsall Street, Birmingham.
 Kinch, Mr. C. J., Henley-on-Thames, Oxon.
 King, Mr. W., 4, Market Place, Huddersfield.
 Kingerlee, Mr. G., Castle Street, Buckingham.
 Kingsford, Mr. F., 54, Piccadilly, W.
 Kinninmont, Mr. A., 69, South Portland Street, Glasgow.
 Kirk, Mr. S., 89, Upper North Street, Poplar, E.
 Kirkbride, Mr. W., 8, Middlegate, Penrith, Cumberland.
 Kirkby, Mr. R., Waterson Ground, Outgate, Ambleside.
 Kirkman, Mr. C. J., Dedham, Essex.
 Kirkup, Mr. T., 1, North Parade, Newcastle-on-Tyne.
 Kitchin, Mr. A., 30, King Street, Whitehaven.
 Knight, Mr. J., 91, City Road, E.C.
 Knights, Mr. J. A., Stockton-on-Tees.
 Knott, Mr. R., 1, Blackburn Road, Bolton.
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 Laird, Mr. W., 30, West Port, Dundee.
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 Lake, Mr. W. P., 50A, Lord Street, Liverpool.
 Lakeman, Mr. N., 4, Broad Street, Modbury.
 Lamb, Mr. T. C., 137, High Street, Chatham.
 Lambert, Mr. J., Elvet, Durham.
 Lamplough, Mr. H., 113, Holborn Hill, W.C.
 Lane, Mr. W., 69, Market Street, Manchester.
 Langdale, Mr. E. F., 72, Hatton Garden, E.C.
 Langdon, Mr. F. B., 65, Old Town Street, Plymouth.

- Langford, Mr. J. B., Wellington, Somerset.
 Langman, Mr. P., Chatteris, Cambridgeshire.
 Langridge, Mr. T. B., Church Street, Midhurst.
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 Law, Mr. A., Alresford, Hants.
 Lawrance, Mr. E., Welwyn, Herts.
 Lawrence, Mr. H., 49, High Street, Kensington, W.
 Laws, Mr. J., 111, Church Street, Edgeware Road, W.
 Lawson, Mr. E. J., High Street, Whitstable.
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 Leach, Mr. J., Crawley, Sussex.
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 Lear, Mr. W. M., Argyle Street, Bath.
 Leare, Mr. J., Sunbury-on-Thames.
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 Leather, Mr. W., Derby Street, Bolton.
 Lee, Mr. J., 9, Kimberley Terrace, Great Yarmouth.
 Lee, Mr. S. W., 5, Church Street, Liverpool.
 Lee, Mr. W., Castle Northwich, Cheshire.
 Lee, Mr. W., High Street, Honiton, Devon.
 Leete, Mr. W. W., Fallow Field, Manchester.
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 Leighton, Mr. J. H., 12, Elvet Bridge, Durham.
 Lemmon, Mr. R., Hythe, Kent.
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 Levie, Mr. A. M.
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 Lewis, Mr. J., 84, High Street, Portsmouth.
 Lewis, Mr. R., 3, Taylor Street, Scotland Road, Liverpool.
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 Ling, Mr. E., Esher, Surrey.
 Linnell, Mr. G., Market Deeping, Lincs.
 Linnett, Mr. S. S., Banbury.
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 Lister, Mr. S., 70, High Street, Great Horton, Bradford.
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 Lloyd, Mr. G. H., 30, Church Street, Bilston.
 Lloyd, Mr. J., Piccadilly, Hanley.
 Lloyd, Mr. J. W., 90, Oxford Street, Swansea.
 Lloyd, Mr. J. W., 30, Mount Pleasant, Liverpool.
 Lloyd, Mr. T. H., 10, Friar Lane, Leicester.

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 Lockyer, Mr. G., High Street, Deptford, S.E.
 Lockyer, W. J., F.C.S., Pembroke Villa, Elgin Park, Redland, Bristol.
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 Long, Mr. A. T., Bognor, Sussex.
 Long, Mr. H., 48, High Street, Notting Hill, W.
 Long, Mr. H., 90, High Street, Croydon.
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 Longley, Mr. G., Castle Northwich, Cheshire.
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 Roberts, Mr. J. B., Bourne, Lincolnshire.
 Roberts, Mr. J., Middleton, Lancashire.
 Roberts, Mr. J. C., Edon Road, Dolgelly, North Wales.
 Roberts, Mr. M., Bangor.
 Roberts, Mr. O., St. Asaph.
 Roberts, Mr. R. M., Foregate, Chester.
 Robertson, Mr. F. F. L., The Infirmary, Havil Street, Camberwell, S.E.
 Robertson, Mr. J., 35, George Street, Edinburgh.
 Robertson, Mr. W., Elgin.
 Robinson, Mr. A. F., 2, Northgate, Darlington.
 Robinson, Mr. B., 1, Broad Street, Pendleton, Manchester.
 Robinson, Mr. H., 1, Canning Street, Liverpool.
 Robinson, Mr. J., Orford Hill, Norwich.
 Robinson, Mr. J., Stanley, near Chester-le-Street, Durham.
 Robinson, Mr. J. F., 9, Orange Court, Castle Street, Liverpool.
 Robinson, Mr. J. F., Frodsham, Cheshire.
 Robinson, J. R., LL.D., F.R.G.S., Westgate, Dewsbury.
 Robinson, Mr. J. S., 1, Eversfield Place, St. Leonard's, Hastings.

- Robinson, Mr. J. S., Alfreton.
 Robinson, Mr. J., Northgate, Darlington.
 Robinson, Mr. R., 58, Yorkshire Street, Rochdale.
 Robinson, Mr. W., Main Street, Cockermouth.
 Robson, Mr. J., 26, Scotch Street, Carlisle.
 Robson, Mr. J. C., 37, Linthorpe Road, Middlesbro'.
 Robson, Mr. T., 4, Victoria Road, Brighton.
 Roddam, Mr. H. R., Ropery Banks, North Shields.
 Rodger, Mr. J., Inverary, Argyllshire.
 Roger, Mr. J. P., Rhynie, Aberdeenshire, N.B.
 Rogers, Mr. A. R., Newmarket.
 Rogers, Mr. S., Shaldon, near Teignmouth.
 Rogers, Mr. W. S., 43, Watergate, Grantham.
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 Roper, Mr. H. E., Oundle.
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 Rowe, Mr. R., Pelham House, Cromwell Place, South Kensington, S.W.
 Rowe, S. T., M.A., Ph.D., Redruth.
 Rowell, Mr. R. H., Houghton-le-Spring.
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 Rowlands, Mr. D., Tregaron, S. Wales.
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 Russell, Mr. J., 111, Nethergate, Dundee.
 Rust, Mr. J., Thaxted, Essex.
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 Samuel, Mr. J. B., 217, Edgware Road, W.
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 Sanderson, Mr. H., 71, Parade, Birmingham.
 Sandford, Mr. G. W., 47, Piccadilly, W.
 Sandiland, Mr. R. B., Bicester, Oxfordshire.
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 Slack, Mr. J. L., Prescott.
 Slade, Mr. J., Tenbury.
 Slater, Mr. J., Wells, Somerset.
 Slater, Mr. J., 76, Bedford Street, Leicester.
 Slater, Mr. T., Stone, Staffordshire.
 Slater, Mr. W. H., Romsey, Hants.
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 Smith, Mr. Alfred, W. P., 21, Duke Street, Edinburgh.
 Smith, Mr. A. W., 93, High Street, Rye, Sussex.
 Smith, Mr. C. S., Cirencester.
 Smith, Mr. D., 54, High Street, Stroud, Gloucestershire.
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 Smith, Mr. J., 12, Worship Street, E.C.
 Smith, Mr. J. B., Dulwich, S.E.
 Smith, Mr. J. De Carle, Magdalen Street, Norwich.
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 Smith, Mr. J. S. T. W., Back Street, Hexham.
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 Smith, Mr. W., 3, Celbridge Place, Paddington, W.
 Smith, Mr. W., Market Place, Nottingham.
 Smith, Mr. W. F., 280, Walworth Road, S.E.
 Smith, Mr. W. H., County Hospital, Brighton.
 Smith, Mr. W. L., Coltishall, Norfolk.
 Smith, Mr. W., Sutton Coldfield.
 Smith, Mr. W., 83, Western Road, Brighton.
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 Snowdon, Mr. R., 52, Robertson Street, Hastings.
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 Southall, Mr. W., Bull Street, Birmingham.
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 Spearing, Mr. J., 53, Above Bar, Southampton.
 Speechly, Mr. G., North Street, Bishop Stortford.
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 Spencer, Mr. J., Undercliffe, Bradford.
 Spencer, Mr. P., Lower Prior Street, Newcastle-on-Tyne.
 Spencer, Mr. T. Asbournby, Lincs.
 Spencer, Mr. W. H., Burnham Market, Norfolk.
 Sprckett, Mr. G., The Drawbridge, Bristol.
 Squire, Mr. A., 1, Bush Lane, E.C.
 Squire, Mr. A. H., 277, Oxford Street, W.
 Squire, Mr. J., 35A, Peascod Street, Windsor.
 Squire, Mr. P. W., 277, Oxford Street, W.
 Squire, Mr. W., High Street, Hanwell, Middlesex.
 Squire, Mr. W., 5, Coleman Street, E.C.
 Squire, Mr. W., Swinefleet, Goole.
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 Stevens, Mr. J., High Street, Broseley, Salop.
 Stevens, Mr. P. A., 70, Hyde Road, Hoxton, N.
 Stevens, Mr. W. G., 53, North Street, Brighton.
 Stevenson, Mr. R., Victoria Street, Derby.
 Stevenson, Mr. W., Todmorden.
 Stevenson, Mr. W. L., 165, Edgware Road, W.
 Steward, Mr. J., High Street, Brierley Hill.
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 Stewart, Mr. J., Cadzow Street, Hamilton.
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 Stoddart, Mr. W. W. B., 9, North Street, Bristol.
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 Sutcliffe, Mr. R.
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 Sutton, Mr. C. W., Stowmarket.
 Sutton, F., F.C.S., Bank Plain, Norwich.
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 Swire, Mr. S., New Park Road, Brixton Hill, S.W.
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Taylor, Mr. R., Paradise House, Oxford.
Taylor, Mr. S., Market Place, Westbury, Wilts.
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Taylor, Mr. W. G., Hungerford, Berks.
Taylor, Mr. W. G., Trent Valley Mill, Nuneaton.
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Thomas, Mr. J. A., Boston, Lincs.
Thomas, Mr. J. D. D., 2, Ashley Buildings, Bristol.
Thomas, Mr. J. J., Garstans, Lanes.
Thomas, Mr. M., Taffswell, Cardiff.
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Thompson, Mr. G., Alston.
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Thompson, Mr. H. A., 22, Worship Street, Finsbury Square, E.C.
Thompson, Mr. Harrison, Moor Street, Sunderland.
Thompson, Mr. J., 11, Aldersgate Street, E.C.
Thompson, Mr. J., Knaresboro', Yorkshire.
Thompson, Mr. J. T., Richmond, Yorkshire.
Thompson, Mr. J. W., Bull Ring, Sedley, near Dudley.
Thompson, Mr. L., Richmond, Yorks.
Thompson, Mr. T., Market Place, Richmond, Yorks.
Thompson, Mr. W. M., 31, Coney Street, York.
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 Thurlow, Mr. H., Ixworth, Suffolk.
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 Todd, Mr. R. P., 16, Robertson Street, Hastings.
 Todd, Mr. T., Colinsburgh, N.B.
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 Tucker, Mr. R. L., Hampton Road, Redland, Bristol.
 Tucker, Mr. C., Bridport.
 Tully, Mr. J., senr., Glen Vue Works, East Grinstead, Sussex.
 Tupholme, Mr. E. H., 394, King's Road, Chelsea, S.W.
 Tupholme, Mr. J. T., 1, Coleherne Terrace, West Brompton, S.W.
 Turner, Mr. C. E., 63, Great Russell Street, W.C.
 Turner, Mr. G., Honiton.
 Turner, H., M.R.C.S., Toad Lane, Rochdale.
 Turner, Mr. J., 23, Stricklandgate, Kendal.

- Turner, Mr. J., Aylesbury.
 Turner, Mr. J. A., Whitefield Road, Liverpool.
 Turner, Mr. J. K., Cleator Moor, *via* Carnforth, Cumberland.
 Turner, Mr. R., Oundle, Northamptonshire.
 Turney, Mr. S. B., 33, Union Street, Plymouth.
 Turton, Mr. R. C., Lansdown Road, South Lambeth, S.W.
 Tuson, Prof. R. V., F.C.S., Royal Veterinary College, Camden Town, N.W.
 Twemlow, Mr. F. E., 300, Holborn, W.C.
 Twemlow, Mr. R., 91, Upper Brook Street, Manchester.
 Twinberrow, Mr. J. K., 80, Wigmore Street, Cavendish Square, W.
 Twinberrow, Mr. J., 53, Broad Street, Worcester.
 Tylee, Mr. J. P., 7, Bridge Street, Bath.
 Tyler, Mr. T., High Street, Stourport.
 Tyrer, Mr. P., 106, Long Lane, Borough.

 Umney, C., F.C.S., 40, Aldersgate Street, E.C.
 Uppleby, Mr. H., 6, Victoria Street, Leamington.
 Upton, Mr. E. J., Wallingford, Berks.
 Urwick, Mr. W. W., 60, St. George's Road, Pimlico, S.W.

 Vaughan, Mr. W. G., 51, North Parade, Aberystwith.
 Veitch, Mr. W., 300, Holborn, W.C.
 Vennall, Mr. G., Cranleigh, Guildford.
 Vicary, Mr. R., 6, Giltspur Street, E.C.
 Vidler, Mr. W. T., 8, Chalk Farm Road, N.W.
 Vince, Mr. J., 41, Cable Street, Lancaster.
 Vipond, Mr. W. D., Middleton Teesdale, Durham.
 Virgo, Mr. C., The Foregate, Worcester.
 Verity, Mr. R., 35, Warwick Street, Regent Street, W.
 Vizer, Mr. E. B., 63, Lupus Street, Pimlico, S.W.
 Voce, Mr. W. G., Dudley Street, Brierley Hill.

 Wade, Mr. J., 174, Warwick Street, Pimlico, S.W.
 Wade, Mr. W., 2, Naval School Buildings, New Cross, S.E.
 Wakefield, Mr. C. H., Blackmore House, Malvern Wells.
 Wakeham, Mr. C., Helston.
 Walford, Mr. R. J., St. Alban's Row, Weymouth.
 Walkden, Mr. J., 169, Cosway Street, Birkenhead.
 Walker, Mr. B. W., 26, Clapham Road, S.W.
 Walker, Mr. C., 133, St. George Street, E.
 Walker, Mr. C. W., 180, Falkner Street, Liverpool.
 Walker, Mr. D. P., 125, New City Road, Glasgow.
 Walker, Mr. H. J., Broad Street, Bath.
 Walker, Mr. J., Manchester Road, Bradford, Yorkshire.
 Walker, Mr. J., 124, High Street, Tewkesbury.
 Walker, Mr. J. D., 1, Abbey Street, Carlisle.
 Walker, Mr. J. S., 60, St. George's Road, S.W.
 Wallwork, Mr. J., Tyldesley, near Manchester.
 Wall, Mr. T.
 Walley, Mr. T., M.R.C.V.S., Veterinary College, Edinburgh.
 Walpole, Mr. W., White Lion Road, Yarmouth.
 Walters, Mr. R., Hooley Hill, near Manchester.
 Walton, Mr. D., Rusholme Road, Manchester.
 Walton, Mr. G. R., Richmond, Yorkshire.
 Walton, Mr. J., 300, High Street West, Bishop Wearmouth.
 Walton, Mr. M. F., Willow Cottage, Sowerby Bridge.
 Walton, Mr. R., 286, High Street, Exeter.
 Wand, Mr. S., 18, Haymarket, Leicester.
 Ward, G., F.C.S., Mechanics' Institution, Leeds.
 Ward, Mr. J. S., Colliergate, York.

- Ward, Mr. W., 3, Wool Market Street, Berwick-on-Tweed.
 Ward, Mr. W. B., 8, High Street, Little Lever, Bolton.
 Warneford, Mr. F., Queen's Road, Brighton.
 Warner, Mr. C. H., 55, Fore Street, E.C.
 Warner, Mr. G. T., 1, Mall, Clifton, Bristol.
 Warrand, Mr. T., Old Brentford, Middlesex.
 Warrell, Mr. E., 202, Caledonian Road, N.
 Warren, Mr. G., 15, Guilford Road, Brighton.
 Warrior, Mr. H., Northallerton.
 Warwick, Mr. D. H., Milbank Crescent, Hartlepool.
 Wastie, Mr. F., 183, Lower Kennington Lane, S E.
 Waterall, Mr. G. E., Nottingham.
 Waterfall, Mr. W., 14, Sea View Terrace, Plymouth.
 Waterhouse, Mr. J., Ashton-under-Lyne.
 Waters, Mr. H. G., Emsworth, Hants.
 Watkins, Mr. W. H., 19, Castle Street, Tredegar.
 Watkinson, Mr. J. W., Kearsley, Farnworth, Bolton.
 Watling, Mr. A.
 Watmough, Mr. H., 26, Cleethorpe Road, Great Grimsby, Lincs.
 Watson, Mr. D., 1, Lower Terrace, Torquay.
 Watson, Mr. J. (Messrs. Hirst & Co.), Aire Street, Leeds.
 Watson, Mr. J. E. H., Rose Lane, Norwich.
 Watson, Mr. J. H., 30, Saltaire Road, Shipley, Leeds.
 Watson, Mr. M., 3, Summerhill Street, Newcastle-on-Tyne.
 Watson, Mr. R. T., 63, Ormonde Street, Jarrow.
 Watson, Mr. T. D., 41, Cross Street, Finsbury, E.C.
 Watson, Mr. T. E., 75, Clayton Street, Newcastle-on-Tyne.
 Watts, Mr. C. C., Cliftonville, Brighton.
 Watts, J., D.Sc., 57, Baker Street, W.
 Watts, Mr. J., Dudley Hill, Bradford, Yorks.
 Watts, Mr. L. R., 175, Pond Street, Sheffield.
 Watts, Mr. W., 10, Bedford Terrace, Kensington, W.
 Watts, W. A., M.A., 80, George Street, Manchester.
 Watts, Mr. W. M., 32, Lower Whitecross Street, E.C.
 Watts, W. M., D.Sc., F.C.S., Giggleswick Grammar School, Settle, Yorkshire.
 Waugh, Mr. A., 177, Regent Street, W.
 Waugh, Mr. J., 178, Chapel Street, Salford.
 Wealthall, Mr. A., 156, Great Jackson Street, Hulme, Manchester.
 Wearing, Mr. W., 37, Cheapside, Lancaster.
 Weaver, Mr. T., The Dispensary, Paradise, Birmingham.
 Webb, Mr. E. A., 60, Bartholomew Close, E.C.
 Webber, Mr. C. F., Sidmouth, Devon.
 Webster, Mr. E. P., Dispensary Lane, Newcastle-on-Tyne.
 Webster, Mr. J., Buckie, Banffshire.
 Webster, Mr. S. M., 33, Bridge Street, Warrington.
 Welborn, Mr. G., The Dispensary, Grantham.
 Welborne, Mr. G., Boughton-under-Blean, near Faversham, Kent.
 Welbury, Mr. G., Bridge Gate, East Retford.
 Welch, Mr. C., 20, Sussex Place, Reading.
 Welch, Mr. T., 29, Mosley Street, Newcastle-on-Tyne.
 Weller, G., J.P., Queen's Terrace, Windsor.
 Wellington, Mr. J. M., Oakham, Rutland.
 Wells, Mr. T., 44, Hampstead Hill Gardens, Pond St., Hampstead, N.W.
 Wells, Mr. W., 23, Church Street, Blackburn.
 Welton, Mr. H., 5, Bishop Street, Coventry.
 West, Mr. E. R., 17, Strand, Dawlish.
 West, Mr. J., 15, Fleet Street, Torquay.
 West, Mr. T., Stretford, Manchester.
 West, Mr. W., Horton Lane, Bradford.

- Westlake, Mr. J., 4, High Street, Sutton.
Westmacott, Mr. G. B., 17, Market Street, Manchester.
Weston, Mr. C., 4, Regent's Parade, Mill Street, Ventnor, Isle of Wight.
Weston, Mr. G., Sleaford, Lincs.
Weston, Mr. S. J., 151, Westbourne Terrace, W.
Westrup, Mr. J., 76, Kensington Park Road, W.
Westwood, Mr. W. B., 16, Newgate Street, E.C.
Westwood, Mr. A., 173, Dudley Road, Brierley Hill.
Wheeldon, Mr. J., 241, Stockport Road, Manchester.
Wheeler, Mr. A. A., Sullivan's Quay, Cork.
Wheeler, Mr. C., Red Lion Street, Redditch, Worcestershire.
Wheeler, Mr. J., Chipping Sodbury.
While, Mr. W. J., 128, High Street, Merthyr.
Whincup, Mr. W., 404, Essex Road, Islington, N.
Whitburn, Mr. A. R., 174, Regent Street, W.
White, Mr. E. A., Mayfield, Hawkhurst.
White, Mr. F., London Road, Nottingham.
White, Mr. G. H., 39, Commercial St., Mountain Ash, Glamorganshire.
White, Mr. J., 20, Paterson Street, Glasgow.
White, Mr. L. P., Penistone, Yorks.
White, Mr. W., 15, Westgate, Bradford, Yorks.
Whitfield, Mr. H., Worcester.
Whitfield, J., F.C.S., 18, Westbro', Scarborough.
Whitla, Mr. J., Monaghan, Ireland.
Whitrod, Mr. H. F., Diss.
Whittaker, Mr. E., Regent Road, Salford, Lancs.
Whittaker, Mr. W., Runcorn.
Whittle, Mr. S., Leigh, Lancashire.
Whittles, Mr. H., Wheeler Street, Lozells, Birmingham.
Whitworth, Mr. J., Littleboro, near Manchester.
Whysall, Mr. W., Grantham.
Whyte, Mr. W., 556, St. Vincent Street, Glasgow.
Wiggin, Mr. J., 34, St. Matthew's, Ipswich.
Wiggins, Mr. H., Oak House, Blue Anchor Road, Bermondsey, S.E.
Wild, Mr. F., 299, Oxford Street, Manchester.
Wild, Mr. J., Clarendon Place, Hyde, Cheshire.
Wilday, Mr. G. E., Market Place, Bicester, Oxon.
Wildsmith, Mr. E., 94, West Street, Leeds.
Wiles, Mr. E., 1, Mitchell Street, Sheffield.
Wilford, Mr. J., 7, Lower Parliament Street, Nottingham.
Wilkes, Mr. J. S., 16, Sparkenhoe Street, Leicester.
Wilkinson, Mr. B. J., 1, Middleton Road, Kingsland, E.
Wilkinson, Mr. G., 267, Waterloo Road, Manchester.
Wilkinson, Mr. T., 270, Regent Street, W.
Wilkinson, Mr. W., 114, Lambeth Walk, S.E.
Wilkinson, Mr. W., Church Street, Colne.
Wilkinson, Mr. W., Hope Street, Crook, Durham.
Wilkinson, Mr. W., 263, Cheetham Hill, Manchester.
Wilks, Mr. M., Chapel Allerton, Leeds.
Willan, Mr. R., 47, Dalton Road, Barrow-in-Furness.
Williams, Mr. C. J., Smith Street, St. John's, Warwick.
Williams, Mr. E., Cerrig-y-Druidion, Denbighshire.
Williams, Mr. E., 10, Wrexham Street, Mold.
Williams, Mr. G. L., Burnham, Bridgewater.
Williams, Mr. H. W., 1, High Street, Barmouth.
Williams, J., F.C.S., 16, Cross Street, Hatton Garden, E.C.
Williams, Mr. J., 72, Camp Hill, Birmingham.
Williams, Mr. J. D., Turret House, Bodmin, Cornwall.
Williams, Mr. J. E., The Eastgate, Chester.
Williams, Mr. J. J., 13, Desboro' Place, Harrow Road, Paddington, W.

- Williams, Mr. J. Vivian, St. Alban's House, Weymouth.
Williams, Mr. P., 21, West Street, Horsham.
Williams, Mr. R., Middleton, Manchester.
Williams, Mr. R., St. Clears, Carmarthenshire.
Williams, Mr. R., 2, Gresham Place, East Brixton, S.W.
Williams, Mr. T., 2, Bridge Street, Aberystwith.
Williams, Mr. T., 11, Bute Street, Cardiff.
Williams, Mr. W., 265, Crown Street, Liverpool.
Williams, Mr. W. H., 13, Upper Baker Street, W.
Williams, Mr. W. J., 137, Cannon Street, E.C.
Williams, Mr. W. P., Long Row, Nottingham.
Williamson, Mr. T. U., Gosford Street, Coventry.
Willis, Mr. B. W., 12, The Foregate, Worcester.
Willmott, Mr. W., King's College Hospital, W.C.
Willmott, Mr. W., 83, High Street, Borough, S.E.
Willsher, Mr. S., Brunswick House, Tenterden.
Wilson, Mr. C. F., 22, Liverpool Road, Stoke-on-Trent.
Wilson, Mr. E., London Road, Sheffield.
Wilson, Mr. E. W., 44, Peploe Street, Bishopsfield, Chester.
Wilson, Mr. G., Greenock, Scotland.
Wilson, Mr. H., 19, Rusholme Road, Manchester.
Wilson, Mr. I., Market Place, Crook.
Wilson, Mr. J., General Infirmary, Derby.
Wilson, Mr. J., 35, High Street, Perth.
Wilson, Mr. J., Penrith, Cumberland.
Wilson, Mr. J. H., 10, West Park, Harrogate.
Wilson, Mr. J. P., 115, London Street, Reading.
Wilson, Mr. R., Clay Cross, Chesterfield.
Wilson, Mr. R. M., Nefyn, Carnarvonshire.
Wilson, Mr. T., Walsham-le-Willows, Suffolk.
Wilson, Mr. T. W., 3, Bootham, York.
Wilson, Mr. W., 21, High Street, Hanley, Staffordshire.
Windle, Mr. W., 452, Edgeware Road, W.
Windsor, Mr. G., East Cornwall House, Torpoint, Devonport.
Wing, Mr. T. N., Melton Mowbray.
Wink, Mr. J. A., 5, Barge Yard, Bucklersbury, E.C.
Witherington, Mr. T., 7, Foregate Street, Worcester.
Wood, Mr. A., New Brentford, Middlesex.
Wood, Mr. B., Northgate, Halifax.
Wood, Mr. E. B., 46, Holloway Road, Birmingham.
Wood, Mr. J., 8, New Street, Barnsley.
Wood, Mr. R., 25, Mill Street, Macclesfield.
Wood, Mr. W. A., 81, Church Street, Hunslet, Leeds.
Wood, Mr. W. H., Front Street, Arnold, Notts.
Woodburn, Dr. J. C., 12, St. George's Road, Glasgow.
Woodcock, Mr. J., 15, Southgates, Leicester.
Woodhead, Mr. J. T., 29, Paradise Street, Liverpool.
Woodhead, W. H., M.D., N.Y., 59, Grosvenor Street, Manchester.
Woodland, Mr. W. F., Chard, Somersetshire.
Woods, Mr. J., North Street, Chichester.
Woodstock, Mr. C., Woburn, Bedfordshire.
Woodward, Mr. J. L., Bridgwater.
Woolcott, Mr. C., 31, Upper Parade, Leamington.
Woolley, Mr. H., Moulton, near Spalding.
Woolley, Mr. H., 69, Market Street, Manchester.
Woolley, Mr. G. S., 69, Market Street, Manchester.
Woolley, Mr. G. B., 7, Middle Row, Maidstone.
Woolrich, Mr. C. B., Uttoxeter, Staffs.
Woolstencroft, J., Carnforth, N. Lancashire.
Wooster, Mr. J. R., 4, Broadway, Turnham Green, W.

- Wootton, Mr. A. C., 44, Burghley Road, Highgate Road, N.W.
 Wootton, Mr. P., Luton, Beds.
 Worfolk, Mr. F., 57, Bridge Street, Bolton.
 Worthington, Mr. W., 2, Camden Place, Preston.
 Wovenden, Mr. H., Sale, Manchester.
 Wright, Mr. A., 109, High Street, Lowestoft.
 Wright, Mr. A., 16, Little Alie Street, E.
 Wright, C. R. A., D.Sc., F.C.S., Chemical Laboratory, St. Mary's Hospital, W.
 Wright, Mr. C. W., 137, High Street, Tewkesbury.
 Wright, F., L.S.A., Stamford Bridge, York.
 Wright, Mr. G., Creswell Cottage, Derby Road, Burton-on-Trent.
 Wright, Mr. G., 29, Congreve Street, Birmingham.
 Wright, Mr. G. H., 103, Boro' High Street, S.E.
 Wright, Mr. J. A., Market Place, Haslingden.
 Wright, Mr. J., 165, King Street, Yarmouth.
 Wright, Mr. T., 108, Granby Street, Leicester.
 Wright, Mr. W. F., Regent Street, West, Leamington.
 Wright, Mr. W. O., 55, Great Scotland Road, Liverpool.
 Wright, Mr. W. V., 50, Southwark Street, S.E.
 Wyatt, Mr. H., 20, Derby Road, Bootle, Liverpool.
 Wyke, Mr. J., 51, Cross Street, Abergavenny.
 Wylde, Mr. G., 53, King's Road, Chelsea, S.W.
 Wyles, Mr. B., Bourne.
 Wyles, Mr. W., 8, Argyle Street, Bath.
 Wyley, Mr. J., Coventry.
 Wyley, Mr. W. F., Hertford Street, Coventry.
 Wyman, Mr. J., 122, Fore Street, E.C.
 Wynne, Mr. E. P., 38, Pier Street, Aberystwith.

 Yarde, Mr. G., 60, Lamb's Conduit Street, W.C.
 Yardley, Mr. E., Ruabon, Denbighshire.
 Yates, Mr. F., 64, Park Street, Southwark, S.E.
 Yeats, Mr. T. F., 68, Market Street, Manchester.
 Yeomans, Mr. J., Sydney Street, Cambridge.
 Yewdall, Mr. E., Wade Lane, Leeds.
 Young, Mr. H. T. B., 105, North Street, Leeds.
 Young, Mr. J., 16, Gallowtree Gate, Leicester.
 Young, Mr. J., 20, High Street, Newport, Mon.
 Young, Mr. J., Folds Road, Bolton.
 Young, J., M.D., 5, Howard Street, Sheffield.
 Young, Mr. J. O., Warrington.
 Young, Mr. J. R., 17, North Bridge, Edinburgh.
 Young, C., F.R.C.S.Edin., 28, Ann Street, Dundee.
 Young, Mr. R. F., New Barnet, N.
 Young, Mr. T., Market Place, Driffild.
 Young, Mr. W., 8, Neeld Terrace, Harrow Road, W.
 Young, Mr. W. D., Cirencester.
 Younger, Mr. T., Brampton, Cumberland.

NOTICE.

Members will please report any inaccuracies in these lists to

PROFESSOR ATTFIELD, *Hon. Gen. Sec.*,
 17, Bloomsbury Square,
 London, W.C.

BRITISH PHARMACEUTICAL CONFERENCE.

1874-5.

ALPHABETICAL LIST OF TOWNS AT WHICH MEMBERS RESIDE.

The names to which an asterisk is attached are those of Local Secretaries.

For Alphabetical List of Names, see page 387.

Aberayron. Jones, J. P.	Alfreton. Neale, H. (Riddings.) Robinson, J. S.	Ashby-de-la-Zouch. Cooper, A. Johnson, S. E. Matthews, F.
Aberdare. Sims, W. Thomas, W. J.	Alnwick. Hunter, H. Newbigen, J. S. Simpson, G.	Ashford, Kent. Ingall, J.
Aberdeen. Davidson, C. McGregor, G. (Ellon). Rattray, W. Sim, J. Strachan, A.	Alresford. Huggins, J. Law, A.	Ashton-under-Lyne. Belfield, W. *Bostock, W. Fisher, E. Hirst, J. Thatcher, T. Waterhouse, J.
Aberdeen (Old). Ross, R.	Alston. Monkhouse, A. T. Thompson, G.	Atherstone. Orme, W.
Abergavenny. Wyke, J.	Alton. Stone, J. J.	Axminster. Gunn, F. J. Pryer, W. S.
Abergele. Lloyd, E., jun.	Altrincham. Hughes, E. Hughes, J. T.	Aylesbury. Turner, J.
Aberystwith. Davies, D. J. Davies, J. H. Vaughan, W. G. Williams, T. Wynne, E. P.	Ambleside. Bell, T. Kirkby, R.	Aylsham. Nicholson, G. D.
Accrington. Astin, E. Cooper, M. (Church.)	Anstruther. Fortune, R.	Ayr. Burns, W. Dobbie, J.
Adlington, Lancashire. Shepherd, C. W.	Appleby. Longrigg, J.	Bacup. Mace, J.
Airdrie, N.B. Harvie, J.	Arbroath. Barn, D. H. Milne, P. Ogilvie, G. P.	Bakewell. Coates, A.
Alford, Lincs. Bryant, R. W. Shaw, C. J.	Ardrossan. Gemmell, H.	Bampton. Gare, W.
	Arundel. Price, T. U.	Banbury. Linnett, S. S. Simpson, T. (Bloxham.)
	Asbournby, Lincs. Spencer, T.	

- Banchory.**
Lunan, A.
- Bangor.**
Griffith, J. E.
Roberts, M.
- Barmouth.**
Williams, H.
- Barnard Castle.**
Badcock, J.
Gibson, B. W.
- Barnstaple.**
Curtis, W.
Goss, S.
Symons, W.
Tremeer, J. J.
- Barnsley.**
Ellison, J. B.
(Wombwell.)
Iberson, J.
Wood, J.
- Barrow.**
Pattison, F.
Willan, R.
- Barton-on-Humber.**
Tomlinson, H. J.
- Basingstoke.**
Sapp, A.
- Bath.**
Barnitt, F.
Brooke, C.
Commans, R. D.
David, J.
Dudden, R. M.
(Midsomer Norton.)
Ekin, C.
Keen, B.
Lear, W. M.
Marsh, J. H.
Merrikin, J.
*Pooley, J. C.
Tylee, J. P.
Walker, W.
- Bathgate.**
Friedland, J.
- Bawtry.**
Jackson, F. J.
- Beccles.**
Steel, J. W.
- Beckenham, Kent.**
Day, T. S.
- Bedale.**
Hawkin, J.
- Bedford.**
Cuthbert, J. M.
Masters, H. J.
Norman, J. S.
- Belfast.**
Davidson, F.
Haslett, J.
Morris, S. H.
Pring, R. W.
- Belper, Derby.**
Burkinshaw, W. T.
- Beeston.**
Faull, E.
- Berriew.**
Tilsley, J.
- Berwick-on-Tweed.**
Davidson, J.
Ward, W.
- Bettws-y-Coed.**
Jones, O. L.
- Beverley.**
Hobson, C.
- Bewdley.**
Harradine, H. G.
Newman, R.
- Bicester.**
Sandiland, R. B.
Wilday, G. E.
- Bideford.**
Dingle, E.
Griffiths, T.
- Bilston.**
Gray, C.
Kearnes, R. H.
Lloyd, G. H.
- Bingley, Yorks.**
Perfect, R.
Skirrow, W. E.
- Birkenhead.**
Bennett, H.
- Darwin, G. H.**
Dickinson, J.
*Dutton, J.
Fawcett, J.
Foulkes, W. J.
Jones, C.
Mullock, R.
Nicholson, H.
Shaw, R. H.
Shillingland, W.
Walkden, J.
- Birmingham.**
Arblaster, C. J.
Atkins, W. S.
Barclay, T.
Bates, J.
Canning, C.
Clayton, F. C.
Foster, J. A.
Grady, F.
Greves, J. B.
Grieves, A. S.
Holdsworth, T. W.
Jones, J. A.
Kimberley, W.
Lear, G. H.
Miller, W. C.
Morgan, W. J.
Nock, J.
Oxborrow, E.
Palethorpe, S.
Plant, G. W.
Price, W.
Sanderson, H.
Sheldon, A. E.
Smith, A.
Snake, E.
Southall, A.
Southall, W.
Thonger, G.
Tucker, H. S.
Weaver, T.
Whittles, H.
Williams, J.
Wood, E. B.
Wright, G.
- Bishop Auckland.**
Armstrong, J.
Dobinson, T.
Harburn, R. H.
*Leigh, J. J.
Thorburn, H.
- Bishop's Castle.**
Owen, J.
- Bishop Stortford.**
Speechly, G.

- Bishop Wearmouth.**
Burn, T.
Walton, J.
- Blackburn.**
Booth, J.
*Farnworth, W.
Hall, J. J.
Moulden, W.
Openshaw, G. H.
Wells, W.
- Blackpool.**
Harrison, J.
Jackson, J.
- Blairgowrie.**
Crerar, J.
Grant, W.
- Blandford.**
Groves, W. E.
- Bodmin.**
Williams, J. D.
- Bognor.**
Long, A. T.
- Bolton, Lancashire.**
Blain, W.
Bowker, W.
Challinor, M.
Challinor, S. M.
Cunliffe, J.
Cunliffe, N.
Dutton, F.
Evans, D. O.
(Farnworth.)
Fisher, W.
Grisdale, T.
Harrison, R.
(Farnworth.)
Hart, J.
Hart, W.
*Harwood, E. G.
Heap, R.
Holmes, T.
Holstead, T.
Knott, R.
Leather, W.
Morris, T.
Moscrop, T.
Pownall, T. R.
Priestley, J.
Richardson, J. V. F.
Ward, W. B.
Watkinson, J. W.,
(Farnworth.)
Worfolk, F.
Young, J.
- Borrowstowness, N.B.**
Hughes, F. R.
- Boston.**
Firman, H. E.
Fowler, W. R.
*Marshall, R.
Pilley, S.
Thomas, J. A.
Scruton, P. D.
- Boston Spa.**
Gill, H.
- Bourne.**
*Mills, R. M.
Roberts, J. B.
Wyles, B.
- Bournemouth.**
Byles, J. H. (jun.)
Mason, J.
Wheaton, W. F.
- Brackley.**
Sirett, H.
- Bradford-on-Avon.**
Saunders, T. P.
- Bradford, Yorkshire.**
Appleyard, R.
Bailey, J. T.
Baxter, W.
Beanland, S.
Bell, F.
Butterworth, A.
Cockshott, W.
Drake, W. (Wyke.)
Farnell, J.
Faull, J.
Handforth, E.
Harland, T.
Harrison, T.
Henderson, C.
Hick, J.
Holloway, W.
Jackson, J.
Jolley, J.
King, W.
Lister, S.
Metcalfe, A. A.
Newsholme, W.
Parker, W.
*Parkinson, R.
Priestley, J.
Pullan, T.
Rhodes, S.
Rimington, F. M.
- Braintree.**
Downing, J. G.
- Brampton, Cumberland.**
Younger, T.
- Brechin, N. B.**
Hodgeton, D.
- Brentford (New), Middlesex.**
Wood, A.
- Brentford (Old), Middlesex.**
Warrand, T.
- Brentwood, Essex.**
Guest, E. P.
- Bridge, Kent.**
Thomas, J.
- Bridge of Allan, N.B.**
Drysdale, R.
Farie, G.
- Bridgend.**
Powell, W.
- Bridgnorth.**
Hughes, H.
- Bridgwater.**
Griffith, W. H.
Williams, G. L.
Woodward, J. L.
- Bridlington Quay.**
Dickins, J.
- Bridport.**
Beach, J.
Tucker, C.
- Rogerson, H. G.**
Savage, J. L.
Sharp, J.
Silson, R. W.
Spencer, J.
Stead, T.
Sutcliffe, J.
Swaine, J.
Tankard, J.
Thornton, H.
Walker, J.
Watts, J.
West, W.
White, W.

- Brierley Hill.**
 Geary, E.
 Steward, J.
 Voce, W. G.
 Westwood, A.
- Brigg.**
 Nicholson, W. O.
- Brighton.**
 Barton, H.
 Billing, T.
 Blacklock, J. D.
 Bradley, T. D.
 Brew, T. A.
 Colby, J., sen.
 Cornish, W.
 Cox, H. E.
 Dinnis, J.
 Dowsett, A.
 Edwards, J.
 Else, W.
 Ettles, J.
 Field, J.
 Foster, F.
 Gibson, W. H.
 Glaisyer, T.
 Guy, F.
 Gwatkin, J. T.
 Haffenden, T.
 Harris, E. R.
 Histed, E.
 Kemp, J.
 Kent, G. F.
 Long, H.
 Merrett, —
 Noakes, R.
 Padwick, J.
 Phillips, J.
 Robson, T.
 Salmon, F. W.
 *Savage, W. D.
 Savage, W.
 Smith, W.
 Smith, W. H.
 Stevens, W. G.
 Warneford, F.
 Warren, G.
 Watts, C. C.
- Cuff, R. C.
 Glossop, G. E.
 Hartland, T.
 Hatch, R. M.
 Lockyer, W. J.
 Martin, F. R.
 Matthews, H.
 Pitman, J.
 Samson, E.
 Saunders, T. C.
 Sprackett, G.
 *Stoddart, W. W.
 Stoddart, W. W. B.
 Thomas, J. D. D.
 Townsend, C.
 Tucker, R. L. (Red-
 land).
- Briton Ferry.**
 Jones, M. H.
- Broadstairs.**
 Poore, E.
- Bromsgrove.**
 Haines, J. J.
- Bromwich, West.**
 *Burch, W.
 Green, J.
 Holliday, T.
 Pershouse, E.
 Roberts, G.
- Broseley.**
 Stevens, J.
- Brynmawr.**
 Evans, A. E.
 Jones, A. M.
- Buckingham.**
 Kingerlee, G.
- Buckie.**
 Bremner, J.
 Webster, J.
- Buckley, Mold.**
 Caunt, W. F.
- Burgh-le-Marsh.**
 Limon, H.
- Burnham, Lynn.**
 Griffin, A. W.
- Burnham Market.**
 Spencer, W. H.
- Burnley.**
 Ashworth, T.
 Crawshaw, E.
- Hay, D. (Nelson).
 Hitchin, R.
 *Thomas, R.
- Burry Port.**
 Olive, W. T.
- Burton-on-Trent.**
 Brierley, J.
 Wright, G.
- Bury, Lancashire.**
 Marsden, W. H.
 Pennington, T.
- Bury St. Edmunds.**
 Clifton, G. F.
 Farrow, C. H.
 *Floyd, J.
 Hardwicke, E. J.
 Jenner, C. S.
- Burslem.**
 *Blackshaw, T.
 Guest, G. C.
 Leicester, T.
 Oldham, W.
- Bushey Heath.**
 Short, E. C.
- Buxton.**
 Ball, E.
 Barnett, A.
 Hutchinson, J.
 Sykes, E. J.
- Caistor, Lincoln-
 shire.**
 Levick, G. A.
- Callington.**
 Dawe, J.
- Cambridge.**
 Church, H. J.
 Crampton, J.
 Deck, A.
 Groves, A.
 Hobbs, D.
 Smith, T.
 Sussum, F.
 Yeomans, J.
- Campbeltown.**
 Barton, A.
- Cambuslang.**
 Black, J.
 Clark, S. P.
- Canterbury.**
 Amos, D.
- Brill.**
 . Holmes, F. G.
- Bristol.**
 Ackerman, T.
 Berry, W.
 Boorne, C.
 Boucher, J.
 Bush, T. (Paulton).
 Carpenter, J. T.

- Bing, E.
 Goodliffe, G.
 *Harvey, S.
- Cardiff.**
 Collier, J. A.
 John, W. D.
 Jones, J. T.
 Joy, F. W.
 Proctor, R. (Penarth).
 Reynolds, T. (Caer-
 philly).
 Thomas, M.
 Williams, T.
- Carlisle.**
 Daniel, J.
 Fisher, J. J.
 Foster, J.
 Gibson, C.
 Graham, J.
 Hallaway, J.
 Pattinson, J. S.
 Pattinson, R. J.
 Sowerby, J.
 Richardson, T. J.
 Robson, J.
 *Thompson, A.
 Todd, J.
 Walker, J. D.
- Carmarthen.**
 Jones, E. B.
 Rees, D.
- Carnforth.**
 Turner, J. K.
 Woolstencroft, J.
- Carnoustie.**
 Nicol, W.
- Castleford.**
 Farrer, C.
- Cerrig-y-druidion.**
 Williams, E.
- Chapel Allerton.**
 Entwisle, J.
 Wilks, M.
- Chapeltown.**
 Gibson, J.
- Chard.**
 Woodland, W. F.
- Chatham.**
 Lamb, T. C.
 Marks, B.
- Chatteris.**
 Langman, P.
- Chelmsford.**
 Baker, C. P.
 Metcalfe, W.
- Cheltenham.**
 Balcomb, J.
 *Barron, W.
 Beetham, M.
 Butcher, T.
 Crawford, S.
 Fletcher, J.
 Forth, W.
 Horsley, J.
 Jeffrey, T. A.
 Smith, N.
 Toone, J. A.
- Chertsey.**
 Boyce, G.
- Chester.**
 Blelock, C. J.
 Baxter, G.
 Grindley, W.
 Higgins, W.
 Hodges, W.
 Jones, R.
 Marcham, J.
 Mills, J.
 Roberts, R. M.
 *Shepherd, T.
 Williams, J. E.
 Wilson, E. W.
- Chesterfield.**
 Wilson, R.
- Chester-le-Street.**
 Coxon, R. J.
 Greenwell, R. H.
 Longbottom, J.
 *Robinson, Joseph
 (Stanley.)
- Chichester.**
 Woods, J.
- Chippenham.**
 Garland, J. F.
 (Marshfield.)
- Chipping Ongar.**
 Chapman, R. J.
- Chipping Sodbury.**
 Wheeler J.
- Chislehurst.**
 Beaumont, C. F. J. B.
- Chorley.**
 Bradshaw, J.
 (Adlington.)
 Lister, J.
 Moss, J.
- Oakes, G.
 Shepherd, C. W.
- Chudleigh.**
 Cleave, W.
- Church Stretton,**
Salop.
 Phillips, J.
- Cinderford, Glou-**
cestershire.
 Cordwin, W.
- Cirencester.**
 Church, A. H.
 Mason, J. W.
 Smith, C. S.
 Young, W. D.
- Clayton-le-Moors.**
 Johnson, M.
- Cleobury-Morti-**
mer.
 Evans, E. P.
- Clevedon.**
 Chapman, H.
- Clifton, Bristol.**
 Barker, C. D.
 Cooper, J. N.
 Giles, R. W.
 Mortimer, J.
 *Schacht, G. F.
 Tilden, W. A.
 Towerzey, A.
 Troake, R. J.
 Warner, G. T.
- Clitheroe.**
 Hargreaves, R.
- Clun, Salop.**
 Darrol, W.
- Coalville.**
 Porter, J.
- Cockermouth.**
 Cooper, W. J.
 Robinson, W.
- Codnor.**
 Farnsworth, T.
- Colchester.**
 Appleby, E. J.
 Cole, F. A.
 Hammerton, E.
 *Prosser, E. T.
 Shenstone, J. B. B.
 Shenstone, W. A.

- Coldstream, N. B.**
 Dodds, N.
- Coleford.**
 Cheese, H.
- Collumpton.**
 Foster, J.
- Colne, Lancashire.**
 Asquith, W. C.
 Wilkinson, W.
- Colinsburgh, N.B.**
 Todd, T.
- Coltishall, Norfolk.**
 Smith, W. L.
- Connah's Quay.**
 Jones, K. A.
- Consett.**
 Imrie, D.
- Conway.**
 Edwards, J.
- Cork.**
 Bannister, W.
 Carnegie, W.
 Cooke, J.
 Selkirk, J.
 Wheeler, A. A.
- Cosham.**
 Baker, G.
- Coventry.**
 Astley, J.
 Glover, H.
 Hands, R. N.
 Hinds, J.
 Hinds, W.
 Hiscock, R.
 Hodgkinson, G.
 *Powers, E.
 Welton, H.
 Williamson, T. U.
 Wyley, J.
 Wyley, W. F.
- Cranbrook.**
 Smith, J. W.
- Crawley.**
 Leach, J.
- Crediton.**
 Jackson, W.
- Crewe.**
 Gray, J. T.
 Place, W. B.
- Crewkerne.**
 Greaves, J.
 Harris, M. C. J.
 Pearce, J.
- Crieff.**
 McGregor, D.
- Cromarty.**
 Johnstone, W.
- Crook.**
 Ditchburn, P.
 Wilson, J.
 Wilkinson, W.
- Crowle.**
 Pickering, J.
 Tebb, J.
- Croydon.**
 Clarke, A. H.
 Long, H.
- Cullen.**
 Kemp, J.
- Darlington.**
 Barlow, S.
 Robinson, A. F.
 Robinson, J.
 Swenden, J.
- Dartford.**
 Armitage, E. H.
 Horrell, A. E.
- Dartmouth.**
 Rees, W. H.
- Darwen, Lancs.**
 Shorrock, R.
- Dawlish.**
 Cutcliffe, G. J.
 West, E. R.
- Deal.**
 Clarabut, J.
 McDiarmid, J. B.
- Dedham, Essex.**
 Kirkman, C. J.
- Denny.**
 Anderson, E. H.
- Derby.**
 Barnes, B.
 Bloor, J.
 Clifton, F.
 Evans, B.
- *Frost, G.
 Medley, W.
 Stevenson, R.
 Wilson, J.
- Devonport.**
 Breeze, G.
 *Codd, F.
 Johns, T. J. R.
 Windsor, G. (Torpoint).
- Dewsbury.**
 Foster, A.
 Fox, G.
 Robinson, J. R.
- Diss.**
 Amyot, T. E.
 Cupiss, F.
 *Gostling, T. P.
 Gostling, W. A.
 Hayhoe, W.
 Thrower, E. A.
 Whitrod, H. F.
- Dolgelly.**
 Roberts, J. C.
- Doncaster.**
 Hasselby, T. J.
 *Howorth, J.
 Parkin, C.
 Shaw, H. W.
- Dorchester.**
 Durden, H.
 How, W.
- Dorking.**
 Clift, J.
- Dover.**
 Adams, R. W.
 *Bottle, A.
 Bolton, J.
 Brown, J. F.
 Cotterell, W. H.
 Forster, R. H.
 Hambrook, J. B.
 Peake, H.
- Driffield.**
 Bordass, J.
 Elgey, J.
 Ross, L. B.
 Sterriker, J.
 Young, T.
- Droitwich.**
 Taylor, E.

- Dublin.**
 Draper, H. N.
 Evans, J.
 Frazer, W.
 Galwey, R. J.
 Goodwin, J.
 Hamilton, J.
 Hayes, W.
 Hoffe, P.
 Holmes, J. T.
 Purefoy, R. D.
 Simpson, R.
 *Tichborne, C. R. C.
- Dunse, N.B.**
 Gunn, W.
- Durham.**
 *Burdon, J.
 Ferrero, A. P.
 Hunter, F. N.
 Lambert, J.
 Leighton, J. H.
 Potts, J.
 Sarsfield, W.
- Ealing, Middlesex.**
 Cook, R.
 Hayles, B. H.
- Earlestown.**
 Peake, A.
- Easingwold.**
 Rookledge, J.
- Eastbourne.**
 Hall, S.
- East Dereham.**
 Abram, F. W.
 Strangroom, F.
 (Cley.)
- East Grinstead.**
 Tully, J., senr.
- East Retford.**
 Appleby, C.
 Fletcher, F. B.
 Welbury, G.
- Eastwood.**
 Ault, J.
 Chambers, J.
- Edinbarnet.**
 Stanford, E. C. C.
- Edinburgh.**
 Ainslie, W.
 Aitken, J.
 Aitken, R.
 Aitken, W.
 Allan, W.
 Anderson, J.
 Anderson, W.
 Archer, T. C.
 Baildon, H. C.
 Blanshard, G.
 Brown, D.
 Brown, D. R.
 Brown, R. S.
 Buchanan, G.
 Fairgrieve, T.
 Field, A. W.
- Gardner, J.**
 Gilmour, W.
 Hill, W. G.
 Howie, W.
 Laird, G. H.
 Linton, R.
 Macadam, S.
 Macfarlane, A. Y.
 MacGlashan, D.
 *Mackay, J.
 Mackenzie, J.
 MacLagan, D.
 McIntyre, E. (junr.)
 Meldrum, E. D.
 Morrison, D.
 Napier, A.
 Nicol, J.
 Niven, W.
 Noble, A.
 Pinkerton, W.
 Purves, S.
 Raimes, R.
 Ritchie, J.
 Robertson, J.
 Sang, E.
 Simpson, J.
 Smiles, J.
 Smith, A. W. P.
 Smith, J. S.
 Smith, P. S.
 Smith, T.
 Stephenson, F.
 Tait, W.
 Taylor, A.
 Walley, T.
 Young, J. R.
- Elgin.**
 Robertson, W.
- Ely.**
 Lincoln, N.
- Emsworth.**
 Waters, H. G.
- Esher.**
 Ling, E.
- Evesham.**
 New, T. C.
- Exeter.**
 Butland, C.
 Collett, C. B.
 Cooper, G.
 Delves, G.
 Gadd, H.
 *Husband, M.
 Longman, J. H.
 Napier, G. L.
 Pasmore, G.
- Dudley.**
 Dawson, J.
 *Dennison, M.
 Dunh, E.
 Fletcher, J.
 Gare, C. H.
 Thompson, J. W.
 (Sedgley.)
- Dufftown.**
 Proctor, A. D.
- Dukinfield.**
 Avison, J.
- Dulverton.**
 Ocock, C.
- Dumbarton.**
 Babbie, J.
 Binnie, R.
- Duncanstone.**
 Ceraig, G.
- Dundee.**
 Anderson, A. B.
 Esplin, A.
 Hardie, J.
 *Hodge, J.
 Jack, G.
 Kerr, C.
 Laird, W.
 Mason, J. B.
 Miller, T. S.
 Park, W.
 Parker, F. C.
 Russell, J.
 Young, C.
- Dunfermline.**
 Seath, A.
 Stiell, G.
- Dunkeld.**
 McDonald, K.

- Pole, S. R.
Stone, F. W.
Walton, R.
- Gateshead.
Elliott, R.
Mayfield, J. T.
- Pearce, T.
Skinner, T.
- Exmouth.
Teed, D.
Thornton, S.
- Glasgow.
Adam, T.
Black, J.
Brodie, R.
Brown, T.
Buchanan, T. D.
Clarke, J. A.
Cowan, —
Currie, J.
Currie, J.
Davison, T.
Dickie, J.
Dun, R. T.
Fairlie, J. M.
Frazer, D.
Fenwick, J.
Forrest, R. W.
Greig, W.
Guthrie, P.
Halley, A.
Hamilton, J.
Harrower, P.
Hunter, J. C.
Jaap, J.
Johnson, A. E.
Kennedy, W.
*Kinninmont, A.
Lockhart, J.
McKenzie, W.
McDonald, H. S.
McDonald, J.
McLeod, T.
M'Gregor, A.
M'Millan, J.
Muir, G.
Muir, M. M. P.
Murdock, G.
Nicol, J.
Pinkerton, J. S.
Semple, J.
Tennent, S. P.
Townshend, R.
Walker, D. P.
White, J.
Whyte, W.
Woodburn, J. C.
- Goole.
Roulston, B. W.
Squire, W.
- Gorleston,
Gt. Yarmouth.
Thurby, G.
- Gosforth.
Gaitskill, J.
- Gosport.
Mumby, C.
- Gourock.
Barr, R.
Peters, J.
- Grantham.
Cooper, H. G.
Fisher, F. D.
Gamble, R.
Hall, T.
*Hopkinson, T.
Newcome, J.
Rogers, W. S.
Welborn, G.
Whysall, W.
- Gravesend.
Bulgin, W.
Drury, G. S.
Smith, G. M.
- Grays, Essex.
Sooles, J. H.
- Great Bedwin.
Gerard, G. R.
- Great Driffield.
Parkinson, T. P.
Ross, L. B.
- Great Malvern.
Burrow, W. B.
Francis, G.
- Great Yarmouth.
Bell, W.
Blanchflower, J.
Lee, J.
Owles, J. J.
Silvers, R.
Skoulding, G. S. F.
Walpole, W.
Wright, J.
- Greenock.
Armitage, G.
- Eyam.
Froggart, T. W.
- Eye.
Nurse, W. S.
- Falkirk.
Murdoch, D.
- Falmouth.
Newman, W. F.
- Fareham.
Batchelor, C.
Franklin, A.
- Farnham.
Higgins, W.
- Faversham.
Lenfestey, W. G.
Welborne, G.
(Boughton).
- Fenton.
Griffiths, E. H.
- Ferryhill.
Smith, R.
- Flint.
Jones, M.
- Folkestone.
Lea, J.
Stainer, J.
- Forfar.
Anderson, D. S.
- Forres.
Michie, J.
- Foulsham, Norfolk.
Newport, W.
- Frizington.
Atlatt, F. T.
- Frodsham.
Robinson, J. F.
- Garstans.
Thomas, J. J.

- Duncan, S.
M'Naught, A.
Wilson, G.
- Grimsby.
Clayton, D. T.
Colton, T.
Cook, R.
Gossop, G. K.
Watmough, H.
- Guernsey.
Anderson, H. D.
- Guildford.
Bushey, H. H.
Jeffries, H.
Vennall, G. (Cranleigh).
- Guisborough.
Bancks, A.
- Hadleigh.
Jones, H.
- Halifax.
Brierley, J. B.
Brook, R.
Dyer, W.
Farr, J.
*Hebden, W. C.
Illingworth, W. H.
Jessop, J.
Pedley, J. (Triangle).
Wood, B.
- Hamilton.
Mackill, R. C.
Scott, W.
Stewart, J.
- Hanley, Stafford.
Booth, R.
*Jones, C.
Lloyd, J.
Tirrell, J.
Wilson, W.
- Harleston.
Muskett, J.
- Harpenden.
Busby, J.
- Harrogate.
Allanson, C.
*Coupland, J.
Davis, R. H.
Taylor, J. H.
Wilson, J. H.
- Hartlepool.
Warwick, D. H.
- Harwich.
Bevan, C. F.
Harding, J.
- Haslingden.
Wright, J. A.
- Hastings and St. Leonards-on-Sea.
Branson, F. W.
Gare, J.
Keyworth, G. A.
*Robinson, J. S.
Rossiter, F.
Snowdon, R.
Todd, R. P.
- Havant.
Chignell, A.
- Haverhill.
Buck, J. E.
- Haverfordwest.
Saunders, D. P.
- Hawkhurst.
White, E. A.
- Hay.
Davies, J. L.
- Hebden Bridge.
Hey, D.
- Heckmondwike.
Booth, J.
Stephenson, J. N.
- Helenburgh.
Finlay, J.
Harvie, G.
- Helmsdale.
Paterson, J.
- Helmsley.
Read, W.
- Helston.
Troake, M. H.
Wakeham, C.
- Henley-on-Thames.
Kinch, C. J.
- Hereford.
McCormick, F. H.
- Hertford.
Durrant, G. R.
- Hexham.
Bell, G.
Riddle, W. R.
*Smith, J. S. T. W.
- Heywood.
Jackson, J.
- Hinckley.
Gilbert, G.
Pridmore, T.
- Hindley.
Slingsby, C. S.
- Hirwain.
George, J. E.
Jones, R. T.
Sims, J.
- Hitchin.
Martin, N. H.
Ransom, W.
- Honiton.
Lee, W.
Turner, G.
- Horncastle.
Carlton, W. P.
- Horsham.
Williams, P.
- Houghton-le-Spring.
Hedley, J.
Rowell, R. H.
- Howden, Yorkshire.
Saville, J.
- Huddersfield.
*Crispin, W.
Cuthbert, R.
Kaye, H.
King, W.
Swift, T. N.
- Hull.
Allison, E.
Anholm, A.
Baynes, J.
*Bell, C. B.
Clarke, I.
Dixon, J.

- Earle, F.
 Grindall, W.
 Hall, H. R. F.
 Hammond, C. T.
 Metcalfe, C. L.
 Milner, J. G.
 Myers, G.
 Peck, F. A.
 Pickering, A.
 Smith, T. J.
 Soutter, J. S.
 Staning, W.
 Stiles, M. H.
 Stoakes, B. M.
- Hungerford, Berks.
 Taylor, W. G.
- Huntingdon.
 Provost, J. P.
- Hyde, Cheshire.
 McLean, J.
 Wild, J.
- Hythe.
 Lemmon, R.
- Idle, Yorks.
 Hopton, E.
- Ilchester.
 Barrett, T. G.
- Ilford.
 Beal, E. J.
- Ilkeston.
 Merry, W.
 Potts, R. S.
- Inverary.
 Rodger, J.
- Invergordon.
 Sinclair, R.
- Inverness.
 Fraser, J.
- Ipswich.
 Callaway, L.
 Cornell, W.
 Grimwade, E.
 Marchant, C. F.
 Sayer, E. C.
 *Wiggin, J.
- Ironbridge.
 Hartshorn, A. F.
- Ironville.
 Greaves, A.
 Greaves, W. S.
- Irvine.
 Gillespie, J.
- Isleham.
 Diver, B.
- Isle of Man.
 Brearey, W. A. (Douglas).
 Carran, T. (Peel).
- Ixworth.
 Thurlow, H.
- Jarrow-on-Tyne.
 Rose, J. D.
 Watson, R. T.
- Jedburgh.
 Peters, J. F.
- Jersey.
 Ereaud, G.
 Le Feuvre, F.
- Kelso.
 Cameron, W.
 Dodds, G. F.
- Keelby, near
 Ulceby.
 Skinner, M. H.
- Kendal.
 Bateson, T.
 Coulter, G. (Sedbergh)
 Hind, T. W. L.
 Mangnall, W.
 *Severs, J.
 Turner, J.
- Kenilworth.
 Barton, H. E.
- Keswick.
 Henderson, M. J.
- Kettering.
 Hitchman, H.
- Kidderminster.
 Hewitt, G.
- Kidwelly.
 Glencrose, W.
- Kilmarnock.
 Borland, J.
- Kingsbridge,
 Devon.
 Troake, W. H.
- King's Lynn, *see*
 Lynn.
- Kingston-on-Thames.
 Tamplin, E. C.
- Kingstown.
 Bennett, H.
- Kington, Hereford.
 Stanway, W. H.
- Kirkby Lonsdale.
 Haythornthwaite, W.
- Kirkcaldy.
 Coutts, A. (Pathhead.)
 Gorrie, A.
 Macknight, S. W.
 Storrar, D.
- Kirkham.
 Blackhurst, W. S.
- Kirkintilloch.
 Morton, T.
- Kirriemuir.
 Ford, J.
- Kirktown St. Fergus.
 Park, J.
- Knaresboro.
 Sindall, J. W.
 Thompson, J.
- Knutsford.
 Silvester, H. T.
- Lanark, N. B.
 Cassels, T.
- Lancaster.
 Allbright, J.
 *Bagnall, W. H.
 Battersby, S.
 Cardwell, E.
 Clark, E.
 Hall, W.
 Johnson, C.
 Vince, J.
 Wearing, W.

- Landport.**
 Ball, W.
 Hackman, L. L.
 Stanswood, J.
- Langharne.**
 David, S. S.
- Langholm.**
 Graham, W. B.
- Launceston.**
 Eyre, J. S.
- Leamington.**
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 *Jones, S. U.
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- Lechdale, Gloucestershire.**
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- Ledbury, Hereford.**
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- Leeds.**
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- Jefferson, R.
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 *Reynolds, R.
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- Leith.**
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- Leominster.**
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- Leven.**
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- Leyburn.**
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- Lincoln.**
 *Hayward, C.
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- Leek, Staffordshire.**
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- Leicester.**
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 *Richardson, J. G. F.
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- Leigh.**
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- Leiston, Suffolk.**
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- Liverpool.**
 *Abraham, J.
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- Fraser, A.
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- Llandilo.
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- Llangollen.
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- Llanwrst.
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- Llanelly.
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- Llangeafni.
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- Loddon.
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- London, E.
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- Walker, C.
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- Smith, J. B.
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- Prichard, E.
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- London, W. C.**
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- Hunt, A.
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- Longton.**
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- Lostwithiel.**
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- Louth.**
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 *Hurst, J. B.
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- Lowestoft.**
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- Ludlow.**
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- Lymm, Cheshire.**
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- Lynn, Norfolk.**
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 *Atmore, G.
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- Lytham.**
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- Macclesfield.**
 *Bates, W. J.
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- Maidenhead.**
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- Maidstone.**
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- Malvern Wells.**
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- Manchester.**
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- Hidditch, T.
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- Wilson, H.
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- Mansfield.**
 *Agar, W.
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- Market Deeping.**
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- Marlow.**
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- Marlborough.**
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- Maryport.**
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- Melbourne.**
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- Melton-Mowbray**
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- Merthyr.**
 Daniel, W. L.
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- Middlesboro-on-Tees.**
 Bell, F. R.
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 *Taylor, H. H.
- Middleton.**
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- Middleton, Teesdale.**
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- Midhurst.**
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- Mildenhall.**
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- Minchinhampton.**
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- Mirfield, Yorks.**
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- Modbury.**
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- Mount Sorrel.**
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- Morrison.**
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- Neath.**
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- Needham Market, Suffolk.**
 Harrington, A.
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- Nefyn.**
 Wilson, R. M.
- Newcastle-on-Tyne.**
 Arnison, W. C.
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- Bowman, H.
 *Brady, A.
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- Newport, I. W.**
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- Newport, Mon.**
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- Newport Pagnell.**
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- Newport, Salop.**
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- New Thornley.**
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- Newton Abbot.**
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 *Poulton, J.
- Newton Stewart.**
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- Northallerton.**
 Fairburn, J.
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- Northampton.**
 *Bingley, J.
 Dadford, T.
 Druce, G. C.
 Griffin, T.
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Pharmaceutical Journal; Chemist and Druggist; Chemical News; Lancet; Medical Times and Gazette; British Medical Journal; Medical Press and Circular; American Journal of Pharmacy; The Chicago Pharmacist.

Provincial Associations (having Libraries).

ASSOCIATIONS.	SECRETARIES.
Aberdeen Society of Chemists and Druggists.	Mr. C. Davidson, 205, Union Street, Aberdeen.
Colchester Association of Chemists and Druggists.	Mr. J. L. Chaplin, 124, High Street, Colchester.
Exeter Pharmaceutical Society	Mr. R. Walton, 246, High Street, Exeter.
Halifax and District Chemists and Druggists' Association.	Mr. W. C. Hebden, 64, North Gate, Halifax.
Hull Chemists' Association	Mr. C. J. Bell, Spring Bank, Hull.
Leeds Chemists' Association	Mr. J. W. Longley, 40, Wade Lane, Leeds.
Leicester Chemists' Assistants and Apprentices' Association	Mr. —, 15, Belvoir Street, Leicester.
Liverpool Chemists' Association... ..	Mr. A. H. Mason, 313, Upper Parliament Street, Liverpool.
Manchester Chemists and Druggists' Association	Mr. F. B. Benger, F.C.S., 7, Exchange Street, Manchester.
Midland Counties Chemists' Association	Mr. J. Lucas, 24, Quadrant, New Street, Birmingham.
Nottingham and Notts Chemists' Association	Mr. J. S. Mayfield, High Street, Nottingham.
North British Branch of the Pharmaceutical Society	Mr. J. Mackay, 119, George Street, Edinburgh.
Sheffield Pharmaceutical and Chemical Association	Mr. H. W. Maleham, 7, Westbar, Sheffield.
Sunderland Chemists' Association ...	Mr. J. J. Nicholson, 226, High Street West, Sunderland.

The following Journals are sent by their respective Editors, in exchange for the YEAR-BOOK OF PHARMACY.

Archiv der Pharmacie, from Professor D. E. REICHARDT, Jena.

American Journal of Pharmacy.

The British Medical Journal.

The Chemical News.

Journal de Pharmacie d'Anvers, from M. VAN PELT, Marché aux Boeufs, 27, Antwerp.

Journal de Pharmacie et de Chimie, from M. G. MASSON, 17, Place de l'Ecole de Médecine, Paris.

Neues Repertorium für Pharmacie, from Dr. L. A. BUCHNER, München.

Pharmaceutische Centralhalle, from Dr. HERMANN HAGER, Pulver Mühle bei Fürstenberg-on-Oder.

PROGRAMME OF THE PROCEEDINGS OF THE BRITISH PHARMACEUTICAL CONFERENCE,

AT THE
ELEVENTH ANNUAL MEETING, LONDON, 1874.

OFFICERS:

President.

THOMAS B. GROVES, F.C.S., Weymouth.

Vice-Presidents.

Who have filled the office of President.

PROF. BENTLEY, F.L.S., M.R.C.S., London.

D. HANBURY, F.R.S., London.

W. W. STODDART, F.C.S., F.G.S., Bristol.

H. C. BRADY, F.R.S., Newcastle-on-Tyne.

Vice-Presidents.

T. H. HILLS, F.C.S., London.

R. REYNOLDS, F.C.S., Leeds.

CHAS. H. SAVORY, London.

J. WILLIAMS, F.C.S., London.

Treasurer.

G. F. SCHACHT, F.C.S., Clifton, Bristol.

General Secretaries.

PROF. ATTFIELD, Ph.D., F.C.S., 17, Bloomsbury Square, London, W.C.

F. BADEN BENDER, F.C.S., 7, Exchange Street, Manchester.

Assistant Secretary.

R. H. DAVIES, F.C.S.

Local Secretary.

M. CARTEIGHE, F.C.S.

Editor of the Year-Book.

LOUIS SIEBOLD.

Editor of the Transactions.

PROF. ATTFIELD.

Other Members of the Executive Committee, 1873-4.

F. C. CLAYTON, Birmingham.

C. EWIN, F.C.S., Bath.

T. GREENISH, F.C.S., London.

W. MARTINDALE, F.C.S., London.

R. PARKINSON, Ph.D., Bradford.

F. M. RIMMINGTON, F.C.S., Bradford.

F. SUTTON, F.C.S., Norwich.

C. UMNEY, F.C.S., London.

Auditors—M. ROGERSON, Bradford; A. ALLCHIN, London.

London Local Committee.

ALLCHIN, ALFRED.	DEANE, JAMES.	HORNCASTLE, JNO.	SAVORY, CHARLES.
ANDREWS, FREDERICK.	EVANS, H. SUGDEN.	HORNER, EDWARD.	SCHWEITZER, J.
ATTFIELD, JOHN.	FAULCONER, R. S.	HOWDEN, ROBERT.	SQUIRE, PETER.
ATTWOOD, ALFRED.	FOWLER, STANLEY.	HUGHES, JOHN.	SQUIRE, WILLIAM.
BARKER, W. R.	FRANCIS, G. B.	HUGILL, JOHN.	STACKEY, S.
BARNES, J. B.	GALE, SAMUEL.	LESCHER, F. HARWOOD.	STARKIE, R. S.
BARRON, FREDERICK.	GOOD, THOMAS.	LINFORD, J. S.	TAYLOR, G. S.
BENTLEY, ROBERT.	GREENISH THOMAS.	LYNCH, THOMAS.	THOMPSON, JNO.
BETTY, S. C.	GULLIVER, W.	MACEY, J. B.	UMNEY, CHARLES.
BIRD, W. L.	HAMPSON, ROBERT.	MCCULLOCH, F.	URWICK, W. W.
BOURDAS, ISAIAH.	HANBURY, CORNELIUS.	MARTINDALE, WM.	WADK, JNO.
BREMIDGHE, ELIAS.	HANBURY, DANIEL.	MATTHEWS, HENRY.	WATSON, T. D.
BREMIDGHE, RICHARD.	HARVEY, CHARLES.	MATTHEWS, WM.	WATTS, W. M.
BROAD, JOHN.	HARVEY, EDWARD.	MAW, CHARLES.	WESTON, S. J.
BUCKLE, C. F.	HERRING, JOHN.	MORSON, THOMAS.	WESTBUP, J.
BULLEN, T.	HILL, A. BOWDLER.	PAUL, B. H.	WILLIAMS, JNO.
CARTRIGHE, MICHAEL.	HILLS, T. HYDE.	REDWOOD, T.	WINK, J. A.
CONSTANCE, E.	HILLS, WALTER.	ROBBINS, JNO.	WOOTTON, A. C.
CRACKNELL, CHARLES.	HODGKINSON, WM.	SANDFORD, G. W.	YATES, FRANCIS.
DAVENPORT, J. T.	HOPKIN, WM. KING.		

By the kind permission of the Council of the Pharmaceutical Society of Great Britain, the Meetings of the Conference, and an Exhibition, took place in the house of that Society, 17, BLOOMSBURY SQUARE, LONDON.

The Sittings for the Reading and Discussion of Papers were held in the LECTURE THEATRE, on Thursday and Friday, August 6th and 7th, commencing at TEN a.m. each day.

An Exhibition of objects of interest relating to Pharmacy was open from TEN a.m. to SIX p.m., on Wednesday, Thursday, Friday, and Saturday, the 5th, 6th, 7th, and 8th of August.

Wednesday, August 5th.

The EXHIBITION was open from 10 a.m. to 6 p.m.

The EXECUTIVE COMMITTEE met at 4 p.m.

CONVERSAZIONE.—The President, Vice-President, and Council of the Pharmaceutical Society of Great Britain, invited the Members of the British Pharmaceutical Conference to a Conversazione, in the House of the Society, at 8 p.m.

Thursday, August 6th.

The CONFERENCE met at 10 o'clock a.m., adjourning at 12.30 p.m.; and at 2 o'clock p.m., adjourning at 4.30 p.m.

Order of Business:

Election of Members.
 Reception of Delegates and Visitors.
 Report of the Executive Committee.
 Financial Statement.
 President's Address.
 Reading of Papers and Discussions thereon.

* * The Local Committee invited all Gentlemen attending the Meetings to Luncheon in the Upper Rooms, between 12.30 and 2.

The EXHIBITION was open from 10 a.m. to 6 p.m.

PAPERS.

1. *The Chemistry of Cinchona Bark, with Reference to its Use in Pharmacy.* Dr. J. E. DE VRIJ.
2. *Extract of Pomegranate Root Bark as an Anthelmintic.* Dr. J. D. DE VRIJ.
3. *The Stearopten of Oil of Nutmeg.* Professor FLÜCKIGER.
4. *The Chemistry of Elemi.* Professor FLÜCKIGER.
5. *Further Report on the Aconitine Bases.* Mr. T. B. GROVES, F.C.S.
6. *The Official Plasters; improved Formulæ for their Preparation.* Mr. A. W. GERRARD.
7. *The Use of Oleic Acid in Pharmacy.* Professor TICHBORNE.
8. *Modification of Liebig's Process for the Estimation of Phosphoric Acid.* Mr. W. W. STODDART, F.C.S.
9. *A new Lactometer.* Mr. W. W. STODDART, F.C.S.

On Thursday evening, at 7, the Members of the Conference dined together at the Terminus Hotel, Cannon Street.

Friday, August 7th.

The EXECUTIVE COMMITTEE met at 9 a.m.

The CONFERENCE met at 10 o'clock a.m., adjourning from 12.30 p.m. till 2 o'clock p.m. The whole of the business of the Conference was completed this day at about 5 p.m.

The EXHIBITION was open from 10 a.m. to 6 p.m.

* * The Local Committee invited all Gentlemen attending the Meetings to Luncheon in the Upper Rooms, between 12.30 and 2 p.m.

Order of Business:

PAPERS.

10. *Cortex Rhamni Frangulæ and its Preparations.* Mr. H. C. BAILDON.
11. *The Presence of Lead in Liquor Ammoniacæ Acetatis.* Mr. L. SIEBOLD.
12. *The Adulteration of Scammony.* T. GREENISH, F.C.S.
13. *The Diluted Hydrocyanic Acid of Pharmacy.* Mr. BARNARD S. PROCTOR.
14. *Notes on the Diluted Hydrocyanic Acid of Pharmacy.* Mr. W. A. SHENSTONE.
15. *Hydrocyanic Acid.* Mr. L. SIEBOLD.
16. *The Preservation of Diluted Hydrocyanic Acid.* Mr. J. WILLIAMS, F.C.S.
17. *The Administration of Phosphorus.* Mr. J. WILLIAMS, F.C.S.
18. *Utilization of Iodoform Residues.* Mr. E. SMITH.
19. *Syrups containing Phosphoric Acid.* Mr. S. DANIEL.
20. *Liquid Extract of Sarsaparilla.* Mr. H. BARTON.
21. *Notes on Extracts of Aconite, Belladonna, Hemlock, Henbane, and Colchicum.* Mr. W. E. HEATHFIELD, F.R.S.E.
22. *The Confections of Pharmacy.* Mr. H. HAFFENDEN.
23. *Notes on Chinese Pharmacy in Hongkong.* Mr. ARTHUR HUNT.
24. *Potable Water, and its Contamination in House Cisterns.* Mr. M. M. P. MUIR, F.C.S.
25. *Medicinal Plants in popular Use amongst the Tuscans.* Mr. H. GROVES.
26. *On the Essential Oils of Wormwood, Citronella, and Cajeput.* Professor C. R. A. WRIGHT, D.Sc.
27. *New Derivatives from the Opium Alkaloids.* Professor C. R. A. WRIGHT, D.Sc.
28. *The Preparation of Trimethylamine.* Mr. T. B. GROVES, F.C.S.

PLACE OF MEETING FOR 1875.

Election of Officers for 1874-5.

Saturday, August 8th.

A pleasant excursion down the picturesque valley of the Thames, from Marlow to Cliefden Woods and Maidenhead, was arranged for the members of the Conference.

BRITISH PHARMACEUTICAL CONFERENCE.

MEETING IN LONDON, 1874.

THE eleventh annual meeting of the British Pharmaceutical Conference was commenced on Wednesday, August 5th, in the house of the Pharmaceutical Society of Great Britain, 17, Bloomsbury Square, London, under the presidency of Mr. T. B. Groves, F.C.S.

MEETING OF THE EXECUTIVE COMMITTEE.

Present—T. B. Groves, President (in the chair); Messrs. Bentley, Stoddart, Brady, Hills, Reynolds, Williams, Schacht, Attfield, Bengier, Davies, Carteighe, Clayton, Martindale, Rimmington, and Umney.

The minutes of the previous meeting were read and confirmed.

A letter from the Editor was read, announcing that the MS. of the "Year-Book" would not be ready till the end of September.

Professor Attfield reported as follows respecting secretarial work done since the previous meeting of the committee:—

Subscriptions.—At date of last meeting (Jan. 22) 600 subscriptions remained unpaid, although two applications (in July and December) had previously been issued. During the succeeding month (to February 21st) 111 came to hand. On February 21st a third application was sent out for the remaining 489. This brought 139. On May 7th, when distributing the list of subjects for research, application was made for the 350 subscriptions then owing. In response, only 25 were received. The 325 members whose subscriptions were in arrear might thus be classified:—

Owe for more than two years	115
Owe for two years	99
Owe for one year	111

325

The members who owed for more than two years (115) had been asked for the subscription some sixteen or twenty times, and a special letter had recently been sent to each, stating that, unless the amount was received within ten days, his name would be removed from the list of members. The 99 in arrear for two years would be

similarly treated next year, unless they responded to further appeals. There remained a few more than 100 who owed for one year. One hundred might be taken as the maximum number of members withdrawing on account of the increase in the amount of subscription from 5s. to 7s. 6d. made in the year which has just ended (June 30th, 1874).

On May 7th the list of subjects suggested for research was sent to every member.

In May, also, local secretaries were appointed in all towns where one did not previously reside, and all local secretaries were advised respecting defaulters, and a few subscriptions thus obtained.

Professor Attfield further reported that at various times during the year he had asked some seventy or eighty gentlemen to contribute results of researches to the annual meeting now about to be held, and he was happy to say that nearly thirty papers, all of pharmaceutical interest, had in consequence been promised.

At the close of the year Professor Attfield, finding that he had nearly one hundred pounds in hand, had ventured to spend most of it in asking chemists and druggists, not already members, to join the Conference. Throughout July he had issued the invitations, and more than 500 gentlemen had offered their names for nomination. Already £200 had thus been contributed to the funds of the Conference, and more candidates were daily applying for enrolment.

Various accounts had been paid since last meeting, as would be seen when the financial statements were read.

The Secretaries were duly instructed to remove the names of 115 defaulters from the lists of members.

Professor Attfield drew the attention of the Committee to five papers, which he thought might, perhaps, be considered unsuitable for the Conference. Abstracts of those papers having been given to the Committee, Professor Attfield was instructed to thank the authors for the contributions, and state that they were scarcely fitted as communications to the Pharmaceutical Conference.

The whole of the candidates mentioned were elected unanimously.

Mr. Brady proposed the name of Mr. William Saunders, of London, Ontario, as an honorary member. It was agreed that the President should bring the name of Mr. Saunders before the general meeting.

Professor Attfield submitted a "programme of proceedings" at the sittings of the members on the following two days. With a few additions, the programme was agreed to.

Mr. Bengier read a draft report of the Executive Committee, which was accepted.

Mr. Schacht, Treasurer, read a financial statement which had been prepared by the Secretaries, and signed by the Auditors.

The Treasurer also submitted the financial condition of the Bell and Hill's Fund.

Mr. Stoddart and Mr. Schacht stated that they were authorized by the pharmacists of Bristol to invite the Conference to Bristol in 1875.

CONVERSAZIONE.

On Wednesday evening many members of the Conference, upon the invitation of the President, Vice-President, and Council of the Pharmaceutical Society of Great Britain, attended a *Conversazione* held in the Society's Rooms. An Exhibition of objects of interest in relation to pharmacy, of which some details are given on subsequent pages, was offered for the inspection of visitors.

GENERAL MEETING.

THURSDAY, AUGUST 6TH.

On Thursday the Conference met for the reading and discussion of Papers at 10 a.m. The first business was the

RECEPTION OF DELEGATES.

The Secretary (Professor Atfield) having announced that, as a result of invitations he had issued, 500 new members had been elected, and that a fresh list of proposed members would be submitted on the following morning,—

Mr. F. B. Bengier read the following list of delegates attending the Conference:—

Hull Chemists' Association.—Mr. Baynes.

Leeds Chemists' Association.—Mr. George Ward and Mr. P. Jefferson.

Nottingham and Notts Chemists' Association.—Mr. J. H. Atherton.

Liverpool Chemists' Association.—Mr. Robert Sumner, Mr. John Shaw, and Mr. A. H. Mason.

Manchester Chemists and Druggists' Association.—Mr. Louis Siebold, Mr. F. Baden Bengier, Mr. Wilkinson, and Mr. H. Woolley.

Midland Counties Chemists' Association.—Mr. William Southall and Mr. H. W. Jones.

Dundee Chemists' Association.—Mr. Wm. Laird.

Brighton Association of Pharmacy.—Mr. Savage and Mr. Barton.

Bristol Pharmaceutical Association.—Mr. G. F. Schacht, Mr. W. Stoddart, and Mr. R. W. Giles.

Bradford Chemists' Association.—Mr. F. Bell and Mr. F. M. Rimmington.

Glasgow Chemists' Association.—Mr. Stanford, Mr. Frazer, and Mr. Fairlie.

Scarborough Chemists' Association.—Mr. J. Whitfield.

North British Branch of the Pharmaceutical Society.—Mr. Mackay, Mr. Baildon, and Mr. Young.

Professor Attfield said there were also present, as visitors from America, Mr. Edward T. Dobbins, member of the American Pharmaceutical Association, and Colonel J. W. Forney, who desired to address a few words to the meeting.

Colonel Forney said: On the 4th July, 1876, the American Government will be one hundred years old, and we propose to commemorate that event by an Exhibition, to afford such proofs of our material and mental progress as will, we trust, be not unacceptable to the people of other nations. We come here to ask that you will send us such specimens of your science and art as will be an invocation and encouragement to our own people; in return for which the Government of the United States has passed a law putting all objects or specimens that may be loaned to the Exposition on the free list, so that if your goods are sent by our American line of steamers their safety will be insured. It is the intention of the thirty-seven states of the Union to contribute to this Exposition, and I think, therefore, you will see that we intend and desire, by asking your contributions, to present to you something that will not be unworthy of your own inspection.

The President said the proposed Exhibition was a long distance off at present, but he had no doubt that, in some way or other, English pharmacy would be represented there.

Mr. F. B. Bengier next read the following report of the Executive Committee:—

REPORT OF THE EXECUTIVE COMMITTEE.

Your Committee have little of importance to report since the last annual gathering. The work of the Conference having been chiefly of the ordinary routine character—a kind of work necessarily increasing in connection with so large an Association—it has devolved mainly on the Secretaries.

At a meeting of your Executive held on January 22nd, considerable discussion took place as to the most convenient date on which to hold the annual meeting for 1874. On previous occasions the Conference has assembled at the time and place of meeting of the British Association, and your Committee has therefore hitherto been relieved of the responsibility of deciding in the matter. It was finally resolved that the meeting should take place in London, on August the 5th and 6th, the house of the Pharmaceutical Society having been kindly placed at the service of the Conference. The Committee was further informed by Mr. Hills, President of the Society, that the Council over which he presided was most anxious to provide every facility for promoting the success of the Conference. It was also resolved in connection with the meeting once more to hold an exhibition of Pharmaceutical novelties and articles of interest, as it was felt that the objects of the Conference would be greatly promoted by such a course.

Appointment of Editor.—At the same meeting of your Committee applications from eight candidates were read, and also letters relating to the editorship, and the merits of the candidates, from various members of the Committee unable to be present. After a full discussion and careful deliberation the election fell on Mr. Louis Siebold, Lecturer at the School of Pharmacy of the Manchester Chemists' Association.

Bell and Hills Research and Library Fund.—A motion was carried authorizing the Treasurer to sell one bond of £50, and to expend the proceeds in aid of research or otherwise, according to the instructions of the Committee.

It was then resolved that £5 be placed at the disposal of Mr. Gerrard to defray the cost of materials to be employed in a research on the official and other plasters; £10 had been forwarded to Mr. Groves to defray expenses incurred in further study of aconitines; and £10 to Dr. C. R. A. Wright to assist him in his researches. Reports by two of these gentlemen will be read at the present meeting. Ten pounds' worth of books, bound in calf, and stamped with the Bell & Hills device, were forwarded to Bradford, and duly acknowledged by Mr. Rimmington on behalf of the Chemists' Association of that town.

Assistant Secretary.—Mr. Robert Higgins Davies, F.C.S., has been appointed to this office.

The Year-Book of Pharmacy.—The late date of the last Annual Meeting, and the sudden departure of the editor for India, caused ten days' delay in the publication of the "Year-Book." The

volume however was issued on the 6th of January, and at once distributed to every member who had paid his annual subscription.

Exchanges for the Year-Book.—Efforts have been made by the junior secretary during the year to establish exchanges with editors of scientific journals at home and abroad. The result has been that some of the leading journals, treating of pharmaceutical matters, in England, France, Germany, and America, are now received regularly by the editor of the "Year-Book" in exchange for our annual volume.

Circular respecting Unusual Doses.—Professor Attfield communicated with the officers of the Conference and with Mr. Hampson on this subject, and the resolutions of the Conference, preceded by an introductory letter, were printed in the form of a circular, nearly five hundred copies of which were posted to the leading physicians of England, Scotland, and Ireland. Although no answer to the circular was requested, several letters commendatory of the course adopted by the Conference were received. The medical and pharmaceutical press generally also gave favourable notices of the matter. Further, written copies of the circular letter, signed by the President of the Conference, were sent to the Presidents of the General Medical Council and Colleges of Physicians of London, Edinburgh, and Ireland, accompanied in each case by a short private note from the President of the Conference. From the English college a letter was received promising that the subject should be brought before the college at the earliest convenient opportunity.

At a meeting of the Committee held last evening, Professor Attfield reported that 200 subscriptions had been paid since the last meeting of the Executive. The names of 115 members whose subscriptions remained unpaid for three or four years, and to whom repeated applications had been made, were ordered to be struck off the list. He had recently sent an invitation to membership to every chemist on the register not already a member of the Conference. In reply to this, 500 new members had already sent in their nomination papers, and these gentlemen were duly elected.

Your Committee cannot close their report without an expression of deep regret at the loss sustained by the Conference in the death of Henry Deane, its first President, and the joint author with H. B. Brady, F.R.S., of the following papers, published in our transactions:—(1) Microscopic Research in Relation to Pharmacy, 1864; (2) Microscopic Analysis, applied to Pharmacy, 1865; (3) Examination of Extract of Flesh, 1866.

Mr. SCHACHT (Treasurer) presented the financial statement as follows:—

The Treasurer in account with the British Pharmaceutical Conference.

<i>Dr.</i>	<i>£</i>	<i>s.</i>	<i>d.</i>
To Sale of "Year-Books" by Secretary . . .	10	2	0
„ „ „ „ Publishers . . .	20	0	0
„ Advertisements in 1872 "Year-Books" . . .	16	7	6
„ „ „ 1873 „ „ . . .	102	14	6
„ Subscriptions from Members . . .	591	14	4
	<hr/>		
	£740	18	4

<i>Cr.</i>	<i>£</i>	<i>s.</i>	<i>d.</i>
By Balance Due to Treasurer, July 1st, 1873 . . .	4	6	4
„ Expenses connected with "Year-Book":			
Butler & Tanner for printing,			
banding, and binding . . . £330	15	11	
Salary to Editor . . .	100	0	0
Messrs. Churchill, 5 per cent.			
commission on advertisements . . .	29	15	6
Advertising "Year-Book" . . .	2	16	0
Foreign Journals—Nutt . . .	7	15	0
	<hr/>		
	471	2	5
By General Printing—			
Butler & Tanner . . .	£18	4	6
Stevens & Richardson . . .	8	10	0
Parkins & Gotto . . .	4	14	10
Byles, Bradford. . .	1	17	0
	<hr/>		
	33	6	4
„ Directing Circulars and Envelopes. . .	3	17	0
„ Assistant Secretary's salary and expenses at			
Bradford . . .	30	0	0
„ Postage . . .	91	19	10½
„ Sundries, including making of four large Cup-			
boards, Telegrams, etc. . .	18	2	9
„ Postages of Invitation to Mem-			
bership . . .	£49	18	4
„ Printing Circulars, etc., of ditto . . .	24	15	0
„ Wrappers . . .	5	13	0
„ Addressing Envelopes. . .	4	8	6
	<hr/>		
	84	14	10
„ Balance in hand . . .	3	8	9
	<hr/>		
	£740	18	4

Bell and Hills Fund.

<i>Dr.</i>	£	s.	d.
To cash in hand, June 30, 1873	20	5	8
„ Dividends on Russian Bonds, October and March	8	11	10
„ Cash from sale of one Russian Bond	48	15	0
	<hr/>		
	£77	12	6

<i>Cr.</i>	£	s.	d.
By amount voted to T. B. Groves, Esq.	10	0	0
„ Grant of Books to Bradford	10	10	0
„ Amount voted to C. R. A. Wright, Esq., D.Sc.	10	0	0
„ Amount voted to A. W. Gerrard, Esq.	5	0	0
Balance	42	2	6
	<hr/>		
	£77	12	6

Examined and found correct,

MICHAEL ROGERSON, }
ALFRED ALLCHIN, } *Auditors.*

Mr. GILES (Clifton) moved the adoption of the report and financial statements.

Mr. HAMPSON seconded the motion, which was carried unanimously.

THE MEETING IN 1875.

Mr. SCHACHT, as chairman for the time being of the Bristol Pharmaceutical Association, begged leave to state that if the Conference should decide on coming to Bristol next year, as was anticipated, the chemists and druggists of the neighbourhood would be extremely gratified, and would do their utmost to make the gathering successful in all respects. .

Mr. STODDART begged to second and cordially endorse the invitation.

The PRESIDENT having thanked both gentlemen and the pharmacists for the invitation, proceeded to read the following Inaugural Address:—

THE PRESIDENT'S ADDRESS.

It will be known to most of those whom I have the honour of addressing, that the original scheme of the British Pharmaceutical Conference did not embrace the contingency of a session held in the metropolis. It was intended to be a peripatetic Society, accom-

panying the wanderings of its elder and more powerful sister, the British Association for the Advancement of Science, of which organization, indeed, some aspiring souls hoped to make it a section or sub-section.

Until this year we have found no difficulty in adhering to our programme, and, however distant our place of meeting, have found a sufficient number of devoted pharmacists to wend their way thither, and there uphold to the best of their power the credit of British pharmacy, endeavouring to convince an unbelieving public that a chemist and druggist's occupation involves something more than the mixing of drugs at the order of a medical superior, and urging, both by precept and example, upon the local chemists, the necessity of union, of cultivation of that professional feeling that should animate every member of a scientific and honourable calling, and suggesting, where it was needed, the formation of local associations, the institution of libraries, in the formation of which it was enabled, by the generosity of one of its leading members, to give effective aid, in the shape of money grants, and generally endeavouring to carry out, to the best of its ability, the programme originally sketched by the founders of the Conference.

The result of ten years of such work has already been reviewed in the last annual address of the retiring President, and it is pleasant to think that, in the opinion of so competent a judge, our efforts have been crowned by a large measure of success.

It would need no gift of prophecy to foretell that so long as the same spirit animates the Conference that has inspired it hitherto, so long will it continue to flourish, so long will it powerfully second the efforts of the Pharmaceutical Society in raising the condition of British pharmacy, and improving the status of the British pharmacist.

It will be necessary now to advert to the reasons that have induced the Conference to deviate from its usual course, and, instead of accompanying the Association to Belfast, to decide on holding its session in London. But first let me acknowledge, without further delay, the courtesy that prompted the Council of the Pharmaceutical Society, in offering, through its President, for the use of the Conference, this lecture-hall for our meetings, and generally the use of its rooms, unrivalled in their special adaptation to our purposes, and further, the promise to afford every facility for the success of our meeting, a success which I, holding so responsible a position, am delighted to consider as now absolutely certain.

It seems that, early last year, inquiries were set on foot to ascertain

what the feelings of the bodies representing in Ireland the pharmacutists and chemists and druggists of this country, were, as to the feasibility of holding a successful meeting in Belfast, during the visit of the British Association. The answers received were unanimous in their deprecation of any such meeting being attempted during the continuance of the differences between the Irish apothecaries and the chemists and druggists of Ireland. Subsequently, on May the 29th, a deputation from the former body was received by the Council of the Conference, and the result arrived at, after long deliberation, was this: that, considering present circumstances, it would not be advisable to hold the 1874 meeting of the Conference in Belfast.

The reasons urged by the deputation, who were very polite in their expressions of admiration for the excellent work performed by members of our organization, showed that the Irish apothecaries were smarting under a sense of injury in consequence of the threatened encroachments of the chemists and druggists on their long-enjoyed privileges, and that, in fact, they declined to meet them as brethren, or countenance in any way their pretensions.

The Apothecaries' Hall of Ireland was instituted by Act of Parliament, 31 George III. cap. 34, which provides for the examination of candidates for the title of apothecary. To this body of examinees is exclusively confided the right to dispense the prescriptions of the medical profession. The original intention of the Legislature, it would seem, was to provide an adequate supply of apothecaries pure and simple, but somehow the curriculum demanded embraced the essentials of a medical education—included, in fact, medicine, surgery, midwifery, and anatomy, all of which subjects the candidate was compelled to pass in, even if he were desirous of limiting his practice to pharmacy only. The practical result was this, that as a medical qualification the diploma of the Hall was not much valued, and the course of study necessary for obtaining it entailing considerably more expense of time and money than a mere pharmacist would be justified in incurring, the labours of the examiners under the Act became lighter and lighter, until the fees for diplomas, at ten shillings each, averaged £10 only per annum. The public inconvenience caused by this limitation of the supply of dispensers, coupled with the feeling of injustice under which the chemists and druggists, many of whom were men of good position and education, laboured, gave rise to an agitation for an alteration of the law in the direction of the Pharmacy Acts, the operation of which had been of such advantage in the case of Great Britain.

The monopoly was not merely injurious, whole districts being deprived, by its influence, of competent dispensers, but absurd. It was competent for one apothecary to open any number of dispensaries, which he might or might not superintend personally, and regarding compounders he was practically under no restriction as to their selection.

It is, therefore, I think, much to the credit of the apothecaries that in their Bill they have voluntarily proposed to trammel themselves with provisos that limit the employees of the pharmaceutical chemist and apothecary to persons who have proved their capability before an Examining Board. A fair amount of time would of course have to be given those now engaged in the business to prepare for meeting the examiners, then there would be an exodus of the idle and incompetent, and matters would speedily arrange themselves in settled and permanent fashion. There need, I think be no fear of opening and reopening of doors by which the idle are encouraged to postpone the evil day when they would have to withdraw somewhat from frivolous pursuits and take to hated study. A time having been fixed, it would, it is to be hoped, be strictly adhered to.

Many pharmacists on this side of St. George's Channel would rejoice if similar provisions could be ingrafted on our Pharmacy Act at some not distant day; but for the arrival of that day we must not be too impatient.

The Irish pharmacy question, being still *sub judice*, I would venture to insist on the great importance of compelling every student, apprentice, and assistant to pass an appropriate examination, and to suggest that, in the event of two grades of pharmacists being instituted, each grade should have its own distinctive title, and not be permitted to use any other, so that the public might be able, without difficulty, to recognize the distinction.

I am of opinion that great, and, I fear, permanent injury has been done to pharmaceutical education in England by the omission of some such precaution. The public has been perfectly bewildered by the variety of titles assumed by holders of the lesser qualification, and remains to this day, and probably will remain till the end of the century, entirely ignorant of the distinction between things that differ so much as the Minor and Major qualifications. And it is not necessary to adopt Carlyle's estimation of "the public"—"some thirty millions, mostly fools,"—to account for such a state of things. What is the result? Young men, not unaware of this, concluding that the "title" is of no pecuniary value, and urged by

no higher considerations, decline to undergo the expense and trouble of obtaining it. One cannot expect otherwise. It is as true now as ever it was that the belly is the real

“Magister, artis, ingenique largitor.”

Deducting perhaps one *per mille*, the rest of mankind are ruled in the main by considerations of profit. Martyrs were never an abundant commodity; they are, I fear, becoming rarer every year.

I am led to these remarks by comparison of the Registers of 1873 and 1874, where I find that in 1873 the examined pharmacentists were 8.93 per cent. of the total number, 12,750, whilst in 1874 they were but 8.92 per cent. of 13,216; the actual numbers in 1873 being 1138; in 1874, 1179; the increase—41 examined pharmacentists, corresponds to a total increase of registered chemists and druggists of all kinds of 466. On the other hand, the chemists and druggists who have passed the Minor only have increased their percentage in the same interval from 7.87 per cent. to 10.59 per cent. I am aware that nothing is more deceptive than figures unless it be facts, and therefore will abstain from forcing a construction of these figures upon this meeting. I fear, however, it must be confessed that the candidates for the Major examination bear no tolerable proportion to those for the Minor.

The evil might be partially met by the adoption, by general consent of *one appellation only*, by all Major associates. Let me suggest Pharmacist (Major). It will, I hope, be understood that my object is not the glorification of the individual, but the conferring upon the title so much of distinctiveness that it might in a reasonable time become sufficiently appreciated by the public to be considered worth some effort and expense on the part of the rising generation.

I fear, however, the rising generation will find some difficulty in acquiring the instruction necessary for obtaining the distinction. Although the School of Pharmacy of the Pharmaceutical Society of Great Britain is but thirty-two years old, one already feels inclined to look back upon its earlier years as upon a golden age that has, alas! passed away. One looks with regret at the statement in the Calendar that in 1843 its lecturing professors numbered four, each one the most distinguished in his department of that day—George Fownes, F.R.S., Chemistry; Theophilus Redwood, Ph.D., Practical Pharmacy; Anthony Todd Thompson, M.D., F.L.S., Botany; Jonathan Pereira, M.D., F.R.S., *Materia Medica*. It is true

the quality of our lecturers has not deteriorated, but their number has been halved, and, worse again, the length of each course has also been halved; in order, it would seem, to meet the demand for "rapid preparation," not to use a shorter and far uglier expression. But where is this to end? Is the School of Pharmacy of the Pharmaceutical Society of Great Britain to descend into the arena and compete with proprietary schools of pharmacy? The old objection of the impropriety of an examining body being also an educating body has of late years been frequently raised, and as often refuted; but I am not sure that now it could be done so easily. It seems to me that the difficulty will soon have to be faced, and the connection now existing between the two bodies severed. Disappointed candidates, it is well known, have ascribed their want of success to the partiality of the examiners for the students of their own schools; and now very recently a professional "crammer" has gone far beyond that, and not scrupled to print and distribute in a circular, addressed generally to students, that he will deliver a course of thirty lectures, etc. "The lectures will review each subject thoroughly, and point out the various tricks and artifices employed to pluck candidates."

The examiners were, of course, aware of the existence of this circular, and feeling themselves strong enough in the good opinion of the world to disregard it, have so done. In that, perhaps, they have done wisely. George Herbert has written—

"Think not thy fame at every twitch will break;
By great deeds show that thou canst little do;
And do them not: that shall thy wisdom be."

But that feeling can be carried too far, and I am not sure that it has not now reached its limit. Should the Society be contemplating any such severance as I have indicated, it would seem only fair to the present staff of professors that it should not be long delayed, lest the ground be already covered, and they left out in the cold.

What seems to be really wanted is a chartered and endowed College of Pharmacy, that should confine its labours to the providing a high-class scientific education for intending Pharmacists. I believe that no such scheme would pay as a private speculation, and that one such, placed in the metropolis, would suffice for the whole of Great Britain. For the endowment of professorial chairs, one might look hopefully, perhaps, towards the Pharmaceutical Society and the wealthier members of our profession.

The School of Pharmacy of Paris, with its staff of twelve professors, and a three years' course, has, at the present time, 500 students attending it. In addition to these must be reckoned those attending the provincial Superior Schools of Pharmacy.

The recent change in the mode of conducting the Preliminary examination will, I think, meet with general approval as a step in the right direction. I think, however, that public opinion will eventually declare in favour of our delegating that office to one or more purely scholastic boards. That is already my opinion.

The reports of the examiners have of late revealed a most lamentable proportion of failures, especially in the Minor. The result is mainly due probably to the prospective increase in the stringency of that examination in October next. Young men, conscious of weakness, are rushing in, hoping by some fluke to pass the ordeal. One is compelled to wonder how or why such men enter the trade, and to speculate on their career as assistants.

The future of British pharmacy, with the present state of which the great mass of pharmacists are so profoundly dissatisfied, will depend in great measure on the class and condition of the young men introduced into the trade as apprentices and students. It has unfortunately been for many years the custom to regard an apprentice as a cheap labourer, and boys, if capable of plenty of work, no matter how ignorant or how rough in manner, were considered eligible for the post. Having no fear of examination before their eyes, they acquired what is called a practical knowledge of the business, and in due time commenced on their own account to keep open shop, as their employers had done before them. In that way, the country has been filled with chemists, with little scientific knowledge and less professional feeling, who, if they succeed in making a decent living, are therewith content, regarding the excelsior aspirations of their brethren as great rubbish. The great, but I hope not increasing, difficulty of finding competent assistants, obliges one to deal tenderly with young men of this class. Proprietors of mixed businesses are, I believe, the chief sufferers from this scarcity, and I fear that their troubles are likely to become more severe than otherwise. Every one sees and knows what the end will be. Young men of education, and presumably of refinement, will decline to do porter's work, and a separation of duties, and possibly of establishments, will be the result.

Every lover of advanced pharmacy will, I am sure, declare this to be a consummation devoutly to be wished.

The necessity, now I suppose generally understood, for a youth to

pass certain examinations before entering business, has influenced and will continue to influence for the better the *personnel* of the trade. For an employer to take a premium from the parents of a youth who he has reason to believe will never be able to enter the trade as a master, would be worse than robbery—not only is the money wasted, but what is of far greater value the youth's time; and it is satisfactory to think that such cases are now of very rare occurrence. Still, many years will, I fear, elapse before we shall be able to tap the right spring, and introduce into our ranks any great number of youths of gentle origin. Parents and guardians who have well-conditioned boys to place out in life are accustomed to well consider the matter before deciding.

The youth has perhaps seen at a popular lecture some brilliant experiments in chemistry, and forthwith decides that he will be a chemist. But his less impressible guardian, before consenting, counts well the cost of such a step, and finding that the mere fact of his being a chemist would, in the eyes of his friends, lower him in the social scale, and be a bar to his entry into the society of his quondam associates and equals, declines to give his permission, and the youth goes, as a matter of course, to swell the already overcrowded ranks of one of the recognised professions.

Popular ignorance on scientific subjects is still so astounding that the general public is quite unable to realize the fact that scientific medicine is impossible without scientific pharmacy, and I think it must also be acknowledged that the ordinary run of practitioners in medicine are not half alive on the subject. High-class pharmacy might here and there be received with favour, especially in large centres, and by the eminent of the profession; but, as a rule, a well-educated pharmacist would find himself unappreciated, and his carefully acquired knowledge daily growing rusty for want of use. Magistrates and public bodies in general would first apply for a chemical opinion, not to a professed chemist, but to a medical man, who, having been examined at the medical school on no end of "ologies" must necessarily in their opinion be the best authority on any scientific point.

In days gone by, there were encyclopædists; there were also at a remoter date, megatheriums; but both have disappeared for ever. Such is the vastness of the field of scientific investigation at the present day, and such the minuteness with which it is worked, that it is simply impossible for one intellect to grasp the whole or any considerable fraction of it.

In order to obtain a useful and a fruitful knowledge of any

subject, attention must be concentrated upon it. We might even go further, and state that the whole of either of the more expanded sciences is too much for any one intellect to know and use effectively. Witness chemistry, whose successful cultivators in the present day have earned distinction by concentrating their attention on one or two departments of the science. It perhaps would not be too much to say that a life's work is to be found in opium, in Peruvian bark, in digitalis.

If the pharmacist claims, as his department of scientific work, the chemistry of drugs and of disease, he will have claimed enough, and have done something to relieve the over-taxed capabilities of his medical coadjutor, and enable him, perhaps, to do what his distractions now so often prevent him from doing—tread the difficult path of original investigation.

So much has been said and written on the operation of the Adulteration Act, that I shall, I fear, in referring to it at all, be telling a thrice-told tale. The conception of the Act was doubtless laudable in the extreme, and by no class of persons was it more sincerely welcomed than by the honest tradesman, who saw in it a defence from the dishonest competition from which he so frequently suffers. The operation of the Act has, however, been far from satisfactory, and the good it has undoubtedly done in checking adulteration has been more than counterbalanced by the injury inflicted on innocent traders. And this has been caused mainly by a straining of the Act on the part of the lawyers, by sensational evidence, and by the lack of commercial knowledge, and even of common sense, on the part of the analysts.

The greatest sufferers have, I suppose, been the grocers, who have been repeatedly fined for selling as tea what had really been received as such at Her Majesty's Custom House, and upon which duty had been paid; for selling as coffee the usual mixture of chicory and coffee, which every one expects to have when he buys the cheap article, and which many prefer to the pure, the packet all the time being labelled plainly, "This is sold as a mixture of chicory and coffee." But the magistrate ruled that that was not sufficient; it ought also to have been declared by word of mouth. In the sale of butter, also, they have been much harassed, the Liverpool case being a notable one, costing a large sum of money in the defence, and after the usual conflict of scientific evidence, ending in the acquittal, and possibly the ruin, of the butterman.

The milkmen have probably furnished as many cases as any, and in most instances have suffered deserved penalties, for I suppose no

article of food has been so systematically tampered with as milk. Yet the dealer who had it proved against him that he had removed the cream, selling skim milk when ordinary milk was asked for, and therefore committing a fraud, was allowed to escape scot-free, because he had *added* nothing to it, whereas his neighbour, who, according to the analyst, had sold, as pure, milk containing an adulteration to the extent of five per cent. of water, was punished!

Finally, the chemist has had his turn. The great citrate of magnesia case depended on the use of a popular, and, if you will, an incorrect designation of a well-known article, and was exempt from even a suspicion of fraud or carelessness. Yet the seller was fined and his business so injured that he had to leave the neighbourhood.

The *bonâ fide* nature of the sale of sweet nitre cannot be doubted, nor can the case that arose from it be described otherwise than as a straining of the law to catch a man who ought never to have been put in jeopardy.

If one commercial fact is more firmly fixed in a chemist's mind than another, it is this—that Howard's preparations are always to be relied upon for purity. Yet we find a most respectable man indicted for selling as citrate of iron and quinine, an article adulterated with cinchonine, that article having been supplied by Messrs. Howard, who explained the slight difference observed by the fact of the article having been overheated during preparation.

The scammony prosecutions, again, point to a most unsatisfactory state of things, and must have caused many an honest pharmacist to wonder whether it would be his turn next to defend his reputation on some trumpery charge.

The report of the Select Committee on the operation of the Adulteration Act has been generally received as satisfactory: it is therefore much to be regretted that the state of public business will not permit of action being taken upon it this session.

The amendments suggested by the Committee are both numerous and important. It was found that some magistrates, regarding the charge as a criminal one, would not allow the defendant to give evidence. That manifest injustice is in a fair way of being remedied: both the defendant and his wife are recommended to be allowed to enter the witness-box, and explain what very often they only would be able to explain. Then again it is recommended, that when an article purchased of a wholesale dealer under guarantee is found to be adulterated, the wholesale dealer should be summoned as well as the retailer. This will be a great boon to pharmacists,

who will, I have no doubt, very generally avail themselves of the guarantee system, and be content to pay accordingly. The pharmacists will, however, I should imagine, be held liable for manifest carelessness in not detecting what ought to have been self-evident. He, of all tradesmen, should be the last to shelter himself by a plea of ignorance; but as for his being expected to subject every one of the thousand articles in which he deals to chemical examination, it is simply absurd.

The report treats the analysts very fairly, but admits that some have shown more zeal than discretion, that others have shown a want of chemical knowledge, and recommends that the latter class should be weeded out by subjecting them to a practical examination. It has been affirmed, on good authority, that some of these gentlemen have set up as analysts after a three months' course only of chemistry, and that, in one case at least, undertaken after the receipt of the appointment. We need not wonder, then, at the occasional display of incompetence.

A main cause of the breakdown of the Act has been the difficulty of obtaining competent analysts possessing a requisite amount of commercial knowledge. It is suggested that in a few years' time there will be an abundant supply of *reliable scientific analysts*, and that, until that time, consolidation should be recommended. But a few years will not give a man the experience that would justify one in placing the reputation, and therefore the living, of a tradesman in his hands. In not taking precaution to prevent the introduction into court of cases of a doubtful character, the select Committee have scarcely shown sufficient appreciation of the extreme delicacy of a tradesman's reputation. It seems that no discretionary power is to be conferred on any one. Should the analyst's certificate report adulteration to the extent of say one per cent., the inspector must cause a complaint to be made before a justice of the peace, and thereupon such justice shall issue a summons, etc., whereas it would seem that the justice of the case would often be met by a caution sent privately by the bench, on the recommendation of the analyst.

Cases have already occurred where, technically, the dealer was wrong, but practically, right; so that, after suffering all the annoyance and injury attending a charge which was really unsubstantiated, he still had to pay costs and a nominal fine. This reminds one of the recommendation to mercy of a West country jury, who, when asked their reason for the recommendation, answered, through their foreman, "Because, sir, we don't think he ever done it."

The plan that I should approve of would be this:—Abolish all local appointments of analysts, and establish at convenient points some five or six analytical laboratories, each superintended by a gentleman of eminence and experience as a chemist, and with some acquaintance with commerce and manufacture. Under him should be placed two or three juniors, who should receive from their superior numbered samples for examination. Each sample received should be twice examined, the analysts being unaware of the source of the samples before them. No sort of collusion could then be practised. On the results being returned to the superintendent, it should be his duty to compare them; if they were alike he would probably conclude that they were exact; if they did not tally, he would inquire the reason why, and direct, or undertake for himself, a further examination. His report to the justices, recommending prosecution or otherwise, might then be acted upon without much danger of inflicting injustice.

The analysts should, of course, be paid by salary, and not by fees, and the right of appeal should be conceded.

An omission, evidently a slip on the part of the authors of the Act, will be supplied, and the fraudulent abstraction of important properties of any commodity will be regarded as a punishable offence.

There is, I am happy to say, some hope of the present Act being practically suspended in its operation until it has undergone amendment.

The question of co-operation remains *in statu quo*; but occasionally evidence is afforded us that such associations are subject to the same misfortunes as other trading concerns. The announcement of the demise of the Universal Drug Supply Association, Limited, did not probably evoke any sincere regrets on the part of London pharmacists.

It is not likely that any action will or can be taken on the general question in the way of repression, but it is still open to question whether the servants of the Crown ought to be allowed to devote their spare time and official training to trading with the general public, to the injury of the shopkeepers who contribute so largely to the taxes out of which their salaries are paid.

The system, if fully carried out, would simply obliterate the middle classes. Should that consummation ever be arrived at, I fear the saving of 5 per cent. on the incomes of the rich will fail to repay the inconvenience the plutocracy will suffer on being brought face to face with the proletariat.

We are likely, if not wide awake to the fact, to be peculiarly injured by this style of trading. Co-operators cannot get advice from the store; they will therefore go to the local chemist for it on pretence of some trifling purchase. We must therefore be on our guard against this gratuitous brain-sucking.

I should like to say a word or two about the trade in patent medicines, a subject to which the attention of the Legislature ought, I think, to be directed. I find that during the financial year ending March 31st, 1873, stamp duty was paid on no less than 12,731,753 packages of patent medicines—considerably over a million more than during the previous year. The revenue thence derived amounted to £95,812 for stamp duties on the medicines, and £7,283 for excise duty on patent medicine vendors. The aggregate of these sums is, of course, a mere bagatelle in the revenue of this great country, so that financial considerations need not be regarded in considering the question whether or not it is advisable that the present system should be continued. I regard the whole system as rotten, and believe it to be productive of great evil. For to what has advertising patent medicines now sunk? It is in the main (I allow some honourable exceptions) a systematic exploitation of the ignorance and credulity of sick people, and therefore, calls loudly for some sort of regulation, if not extirpation. The medical profession, who are more nearly concerned with the public health than are the chemists, will best appreciate the extent of the evil, and to them rather it appertains to suggest a remedy for the abuse.

At a meeting of the Society of Pharmacy of Paris, it was announced by M. Boudet, that the committee appointed for the purpose had prepared its report on the International Pharmacopœia, in readiness for presentation to the St. Petersburg Congress. The nature of the report did not transpire. It is to be hoped that its recommendations will not be too elaborate, a failing to which the French are inclined, and that the attention of the Congress may be fixed on assimilating the formulæ for the preparation of a small number of what may be termed heroic remedies.

The number of drugs actually necessary for the treatment of disease by a true physician is comparatively small, and one can venture to hope that if the scope of the International Pharmacopœia be limited to these, something might be effected in this generation. The *Denarium Medicum* of Bernardus Penotus, published at Berne in 1608, proposes to show how all internal diseases may be cured by the ten remedies he describes. Isaacus Wollandus requires three only; Paracelsus only one, and justifies himself as follows:—

Out of the trunk of one tree you may carve as many as 600 images, but one fire will consume the whole of them. In the same way, the various kinds of disease which are almost innumerable, may yet with one not over-violent remedy be all cured." It has already been decided that the text shall be in Latin, and the weights used the metrical. Professor C. W. Thomas suggests that proportional parts by weight would be more convenient at the present; but I do not see how, when the dose comes to be apportioned, a definite unit can be dispensed with. His other suggestion—a general Pharmacopœia for all English-speaking communities—is a very good and seemingly practical one. The Germans and Scandinavians have already accomplished something of the kind, but their task, owing to the absence of colonies, was a comparatively light one.

When works of this magnitude have to be undertaken, we look around for men equal to the occasion, but every year, unfortunately, it is the melancholy duty of the president to have to refer to the removal of one or more of the pillars of pharmacy. This year the task is especially heavy, as we have lost in Henry Deane, our first president, who, if not the originator, may truly be styled the founder, of the Conference. It was to his wisdom, displayed in guiding the course of the Conference during the first years of its existence, that we owe much of its present prosperity, and to him we were indebted for some of the best papers that have been presented to it. Mr. Deane's reputation as a man of science was, however, by no means limited to this field; his fame, more especially as a microscopist, was widely and generally known. His social qualities were better known to many present than to me. We never realize the value of a thing till we have lost it, and now it often occurs to me how foolish I was not to avail myself more frequently of opportunities of cultivating his society. Mr. Deane had his gay as well as his grave moments, and then no man could be more genial or amusing. I am not one to say "we ne'er shall look upon his like again," but am hopeful that the contagion of his example will spread among the rising generation, and produce equally good results in future years. We then shall be able to say, in the words of the epigrammatist:

"Mira cano, Sol occubuit, nox nulla secuta!"

In Mr. George Dymond we have lost a useful and talented member, who has held office in the Conference, and to whom we often were indebted for remarks of great value in our discussions; he was also a contributor to our transactions. He died at the early

age of 44, when to all appearance he had before him a long life of activity and usefulness.

We never again shall see amongst us the familiar form and genial countenance of Thomas N. R. Morson, who also has departed. Mr. Morson's reputation as a pharmaceutical chemist was literally world-wide. He was not only the first manufacturer in this country of many of the rarer chemicals, but was for very many years reputed the best. His connection with the Conference was, I believe, limited to membership. As a contributor to our discussions no man spoke with greater weight or was listened to with more respect. A few observations from Mr. Morson would make an otherwise sterile paper at once fruitful with good—in that capacity we shall much miss him. His death has left a void in scientific society that will not readily be filled up.

In concluding my address, which I fear has already become tedious, I will, as shortly as I can, refer to the action taken by the French pharmaciens when it was proposed to subordinate, in the French army, pharmacy to medicine. The movement was begun by the doctors, and on their representation referred to the Academy of Medicine to report thereon. In the end the doctors were defeated, pharmacy retaining its old independent position. The advocates on the side of pharmacy were MM. Bussy, Boudet, Poggiale, and Dumas, the latter of whom, himself a pharmacien by education, delivered a speech full of sentiments worthy of remembrance by the pharmacists of England.

"If it be true," he says, "that the pharmacien, in dispensing the prescription of the medical man, is really his subordinate, how is it in the case of the selection, preparation, and titration of drugs and preparations, in all of which most important operations the pharmacien is the sole responsible person, and for the control of which medical men are, and must be, wholly incompetent? '*On ne fait pas de bonne chimie en passant*,' was a dictum of no less a person than Gay-Lussac; and the fact of a physician's time being so fully occupied by his medical duties, and rendered fragmentary by frequent and unexpected calls for his services, renders it impossible that he ever can be able to devote that continuous application to chemical details from whence alone proceed good pharmacy and sound chemical hygiene." "From the ranks of French pharmaciens have issued many distinguished discoverers. To mention those only who have departed, Rouelle, Baumé, the two Pelletiers, Robiquet, Serullas, Soubeiran, Pelouze, Balard." "Let medicine, then, exalt the level of its instruction, and extend the area of its services,—all the

world will applaud it for so doing; but let the Academy be convinced of this, that to diminish the importance of pharmacy is not necessarily to increase that of medicine. The art of healing cannot be separated from the highest chemistry; it needs its help at every moment, and if clinical studies and physiological experiments point the way, it is the chemical analysis of the normal and morbid products of the economy which sustain its steps and prevent them going astray."

The pharmacists of England, now in a very slow state of transition, will have some difficulty in realizing the feelings of their brethren across the water under the above circumstances. The time, however, will come when throughout Europe the position of pharmacists will be assimilated. It must not be forgotten that the desired change cannot be effected in a day by Act of Parliament. "They who would be free themselves must strike the blow," and the British pharmacist, in order to achieve the object of his ambition, must be prepared both to do and suffer in the cause. If trading instincts are allowed to smother professional feeling and practice, a trader he will and must remain; if otherwise, pharmacy will eventually in this country attain the status it has so long enjoyed on the Continent, and render services equally beneficial to the community.

Mr. CALEY, in proposing a cordial vote of thanks to the President, said: An able and interesting address we should expect from Mr. Groves, whom we have known for so many years, and whose writings we have all read. I doubt not that this meeting will, in all respects, equal, and probably surpass, the meetings which have been held in other places; and I am sure that Mr. Groves will acquit himself as the Presidents on previous occasions have done, and that we shall all have good cause to be pleased with his election. I will not comment on any portion of the address, which we shall have an opportunity of reading at our leisure, but I would make a remark on just one subject. We have lost three eminent members of the Conference, Mr. Deane, Mr. Morson, and Mr. Dymond, during the past year. Those who remember what the Pharmaceutical Society was twenty-four or twenty-five years ago, will recollect what very important members the two first-named gentlemen were. I look back with great pleasure to passing through the rooms upstairs when those two gentlemen sat as examiners; their kindness and their courtesy was such as could not be surpassed, and I, for one, have great cause to remember them with respect and gratitude. I beg to propose

that a cordial vote of thanks be given to Mr. Groves for his very able and interesting address.

Mr. GOSTLING: I have very great pleasure in seconding the motion. The address is so comprehensive that it would ill become me to attempt any comment on the various points which are introduced; but the wise suggestions which were made on the various matters so ably brought forward will doubtless receive the patient and careful consideration of every member of the Conference in reading them. It is impossible for us to carry in our minds so many points as the President has brought before us, but there are many of great importance which will have to receive the consideration, not only of ourselves, but of the Pharmaceutical Society: such, for instance, as the prospects of the rising chemists, their titles and their qualifications, and their interests in the future. As fathers introducing sons into our businesses, we feel great interest respecting them, and sometimes have some fear whether the next generation will do as well as the honoured generation before us have done. I have much pleasure in seconding the vote of thanks to the President.

Mr. T. H. HILLS: As President of the Pharmaceutical Society, I beg to support this motion, and to offer to the President the best thanks of the Council and members of the Society, not only for this address, but for the honour that he and the members have done us in coming and occupying our rooms. I consider the Pharmaceutical Society and the Pharmaceutical Conference are one. I have the honour to hold the office of Vice-President of the British Pharmaceutical Conference, although I have done very little beyond looking on, and saying, "Go on, my young friends." I think they have made a capital commencement, and I am sure they will successfully carry out what they have begun so well.

The resolution having been carried unanimously,

The PRESIDENT said: Gentlemen, I can assure you when I was proposed to occupy the very important position that I hold, I accepted it with great trepidation; and the matter of the address was to me a very serious affair. When I came to compose it, I found the number of subjects to be included was something alarming. I should have preferred giving a scientific *résumé* of the work done during the year, but these things are rather overdone in the present day, or are likely to be; and, therefore, I decided to follow the line I have adopted. In doing so, I am afraid I have trodden on the corns of not a few, and do not at all suppose that my opinions will meet with general approval; but I hope they may act as a ferment and set others thinking, and do good in that way. There are many points

on which I know I hold views peculiar to myself, but still I thought I was bound honestly to bring them forward. If you will only accept my effort in that spirit I shall be well satisfied.

After the President's address the reading of papers was proceeded with. The first paper was on—

PHARMACEUTICAL TESTS FOR CINCHONA BARK.

BY DR. J. E. DE VRIJ.

Notwithstanding the voluminous literature about cinchona barks, there are still many links wanting in our knowledge of this valuable medicine.

Thus, for instance, although we are tolerably well acquainted with the chief therapeutical agents contained in good barks, viz.:—

1. Cinchona Alkaloids.
2. Cinchotannic Acid.
3. Kinovic Acid,

we know very little about the state in which they exist in the bark, and hence the little therapeutical value of many of the pharmaceutical preparations of bark.

Besides the powder which naturally contains the three mentioned therapeutical agents, I am only acquainted by my own experience with one pharmaceutical preparation which equally contains them, but without the vegetable fibre, viz., the alcoholic extract of bark. Water is, however, frequently the solvent used in the pharmaceutical preparations of bark, and, therefore, as I have found by experience that the quantity of the therapeutically active substances extracted by cold water from bark is very different in using different kind of barks, I consider that it will be beneficial for the pharmacist, if he is able, to test the bark which he wishes to use in his pharmacy.

The tests prescribed by some Pharmacopœias, besides that they require too much time to be generally applied in all pharmacies, are too one-sided, as they only determine the quantity of the total alkaloids, or of the quinine, contained in the bark. This determination alone, although sufficient for the quinine manufacturer, is not so for the pharmacist.

If the physician in prescribing bark, or any of its pharmaceutical preparations, had only in view to prescribe the alkaloids contained in them, he would do much better to prescribe the alkaloids themselves, and I suppose therefore that he intends to apply also the

other active substances of which the astringent matter, called cinchotannic acid, is preponderant. During my numerous investigations of Indian barks, I have found, by a pure accident, that the relative quantity of this substance in different barks may equally be ascertained, together with that of the alkaloids, in the following manner :—

One part of powdered bark is mixed with about four parts of distilled water to form a thin semi-fluid paste, which, after some hours' maceration, is packed in a percolator. When the liquid has percolated, more water is poured into the percolator till four parts of clear liquid are obtained.

To apply the test this liquid is divided into four equal parts.

One part is tested by strong hydrochloric acid.

One hundred grains require about fifty minims of acid.

Another part is tested by clear lime water, which is added till the liquid has a decidedly alkaline reaction.

These reactions, in applying them to different barks, will, after some experience, enable the operator to judge the pharmaceutical value of the barks, and convince him, for instance, that the Indian barks are in general better adapted for purely pharmaceutical purposes than the American barks.

This is illustrated by examples of the following Indian barks :—

1. Calisaya, from Java.
2. Hasskarliana seu Calisaya hybrida.
3. Officinalis (Ootacamund).
4. Pahudiana (Java).
5. Succirubra (Jamaica).
6. Ditto (Ceylon).
7. Bark from Apothecaries Hall, alk. 8 per cent., $[a]_D^{20} = 38.3^\circ$; Indian succirubra.

If the operator wishes also to estimate the relative quantity of the total alkaloids, he may easily do so by testing a measured quantity of the percolated liquids by a standard solution of tannic acid, by which he can compare the amount of alkaloids fit for pharmaceutical use contained in the different barks subjected to his investigation.

The PRESIDENT: I am sure you will feel with me that we are highly favoured by the presence of Dr. de Vrij. I agree with him that we have yet a great deal to learn respecting these barks. Probably, as I have already said, for their proper study, the labour of a life would be required. I am quite incompetent to criticise in any

way Dr. de Vrij's statements, and probably after we have seen them in print we shall be able to make more of them. I am happy to say, however, that Mr. Broughton is present, who is also an authority on Indian barks, he being chemist to the Government on the cinchona plantations in India. We shall be happy to hear any remarks from him.

MR. BROUGHTON: I have listened with very great interest to the able paper we have just heard. The subject of the cinchona barks of India is rather a large one, and I shall not be able in the short time at your disposal to give any very general information on the subject; but I may mention that in the course of my work, I have determined with some precision the state of the alkaloids as they exist in the green bark. I find they exist nearly in the proportion of one-fifth of their total quantity as quinate, and the remainder as cinchotannate. The method by which I determined this point was as follows:—I obtained a quantity of fresh green bark of the *Cinchona succirubra*, and had it squeezed in a powerful press until it became nearly dry; but in order to be quite accurate, the amount of water remaining was also determined. I found on analysis of the liquid which came from the bark, that one-fifth of the total alkaloids in the bark, which was also determined by analysis, was to be found in the liquid squeezed from it. I also determined the amount of alkaloids left in the bark after squeezing, and found that four-fifths of the alkaloids in the bark existed, after the soluble portion had been expressed, as tannates. Tannates of the alkaloids are but very slightly soluble in water, and it is for this reason that there is such a difference in barks on testing. If a bark contains a large amount of tannates, and has been kept for a year or a year and a half, the tannate is oxidized, and forms an insoluble compound, with very little taste; but if, on the other hand, the alkaloids in the bark exist as quinates, the bitter taste is very perceptible, even after long preservation. I quite agree with Dr. de Vrij as to the very variable character of barks. For instance, the bark of the *Cinchona officinalis* has totally different characters, on analysis, in taste, in quinine, and in tannic acid, to that of the *C. succirubra* or the red barks. The quinovin in the bark, which is a very general constituent of all the cinchona barks I have met with, exists, not in combination with the alkaloids, but in an insoluble state, and only becomes apparent when the bark is exposed to the action of an alkaline solvent. I do not know that I can add anything more of special interest, and, as I have already said, the whole subject of Indian barks is too large to enter upon now.

The PRESIDENT: Are the barks ever treated in India in the green state for the production of quinine on a commercial scale?

Mr. BROUGHTON: All the barks used in India are employed in the green state; but we do not make sulphate of quinine. The whole of the alkaloids are precipitated together, and so employed in medicine. The reason of that is that the *succirubra*, which is the most common of all the Indian barks, contains a very small proportion of quinine, but a large amount of cinchonidine. And it has been found, by very careful medical experiments, numbering I believe some 4000, that cinchonidine is almost, if not quite, equal as a febrifuge to quinine. There has been no advantage found, therefore, in separating the alkaloids, as has been the custom for pharmaceutical purposes in this country.

Mr. UMNEY: I regret that I was not present at the beginning of Dr. de Vrij's paper, but I should wish to add that I have been working for some time at the fluid extract of cinchona, and have in my hand an incomplete paper on the subject. I have been more especially working at processes for the production of a fluid extract, because as we all know, the process of the British Pharmacopœia is a most wasteful one, the amount of alkaloid left behind being almost as great as that dissolved by the water; perhaps about 60 per cent. is taken out, and about 40 per cent. left in. I certainly look upon the fluid extract of the British Pharmacopœia as an unnecessary concentration. It by no means follows, if you have fine Calisaya bark, that you will get a good fluid extract; on the contrary, sometimes the finest barks will not yield more than 18 or 20 per cent. of completed fluid extract, and this unsatisfactory. If you search the Pharmacopœias of Germany, America, and I doubt not others also, you will find no fluid extract carried to such a degree of concentration as we have in this country. The fact is we still follow the process given some forty years ago before the College of Physicians, when very little was known about cinchona bark. But I think we might well take as a standard the other fluid extracts of the Pharmacopœia, and make this extract of the strength of one drachm to the fluid drachm, and I believe that percolation with proof spirit for fluid extract of bark would answer very well. I may also say that I have recently examined the fluid extracts of cinchona of trade, and in the majority of cases I am confident they are being made from Indian barks which do not contain quinia. After what Mr. Broughton has said, I am sure we shall not dispute that these barks are equal, if not superior, to those of South America in many respects; but as the matter stands at the present time, we have no

right, according to our Pharmacopœia, to substitute these Indian barks, containing no quinia, for the Calisaya bark there prescribed. I say this because I find, on examination, that not more than one-fifth of the trade specimens yield a trace of quinia—almost the whole of the alkaloids in the fluid extracts being cinchonine and cinchonidine. I have made a fluid extract from some of the barks grown in India, containing 4 to $4\frac{1}{2}$ per cent. of crystallizable sulphate of quinia, and these barks yield a beautiful fluid extract, and to such substitution I do not object. I hope shortly to publish many of the experiments I have made in this direction.

Mr. D. HANBURY: Is not Calisaya bark grown in Ceylon as well as in Bolivia?

Mr. UMNEY: Undoubtedly; but I referred to the flat Calisaya bark of the Pharmacopœia, such as we are accustomed to see from South America.

Mr. GILES: Unfortunately, every pharmacist who has anything to do with the manipulation of barks, must feel that this subject is one which requires the study of a life, and that it cannot be sufficiently exhausted, even by those who only are qualified to lead us in such matters—the chemists. In pharmacy we are all floundering about, and coming to the conclusion that such a thing as an efficient formula to represent the cinchona barks does not exist, though it is a great desideratum. I entirely concur in the observations which have been made by Mr. Umney as to the mistake in the preparation of the liquid extract; I think the process is carried too far, that it is wasteful, and totally unsatisfactory in its results. Frequently the extract, when it comes to be diluted to an extent which ought to bring it back to something like the pristine condition as obtained from the bark, is a horrible combination, like mud and slime, offensive to the taste, and likely to disturb an unsettled stomach instead of being advantageous to it. When I examine barks for the purpose of obtaining one suitable for a liquid extract, it generally happens that I have to try half a dozen samples, which is a very tedious process, and I am sure we shall all welcome any suggestions from Dr. de Vrij, which will enable us to arrive more quickly at a conclusion. I have not found any experiments of any value except actual manipulation, and I generally take about seven pounds of bark, make an extract from it, and if it answers well, buy it. Of late years, however, it has been very difficult to get a bark at all satisfactory; sometimes you get one yielding a good product, but it is difficult to get a fair return for the original cost of the bark; and it is much more common to get a copious result, which is

altogether distasteful—harsh, acrid, disagreeable, not bitter, and not fit to be sent out. This whole subject is in a most unhappy state, and we are all deeply indebted to Dr. de Vrij for bringing his scientific knowledge and practical experience to bear on the pharmaceutical aspect of this question. I believe cinchona bark is not only valuable in itself, but infinitely more valuable than quinine, and that no greater mistake has been made than in confining our attention to quinine, and rejecting all the other alkaloids. What we really want is to produce something which shall be cinchona bark *minus* the woody fibre. That is the great problem; it has occupied a great deal of my attention, because it presents more difficulties than almost any other, and it is utterly beyond my power to resolve. I hope Dr. de Vrij will kindly devote still further attention to the pharmaceutical aspect of this subject.

Dr. DE VRIJ begged to thank those gentlemen who had spoken so kindly of his efforts as to encourage him to continue his researches. He had heard with great satisfaction the remarks of Mr. Giles, which reminded him that some weeks ago he had been asked to deliver a lecture before the Society of Physicians of Holland on cinchona and its alkaloids from a medical point of view. He then gave a sketch of what was known of cinchona from its first introduction into medicine, and the unhappy fact that, by an entire accident, quinine only had received attention, the other alkaloids being almost neglected. He then went on to give it as his opinion that the only form in which cinchona ought to be prescribed was that of alcoholic extract, and that in order to make such an extract they should not use the Calisaya bark (which was much superior to all other kinds for making quinine), but the red barks, particularly those of India, they being much richer in the alkaloids in general, though not in quinine, and also in cinchotannic acid. He had lately had a proof of the efficacy of such an extract in his own family; the physician who had been attending his sister, after giving her sulphate of quinine, saying this must be followed by bark, but that as he (Dr. de Vrij) was better acquainted with the best forms, he would leave it to him to select it. On talking with the physician, he said he would make an extract, and tell him how much he got from a certain amount of powder, and he could then prescribe the dose. The physician ordered three grains to be taken four times a day, and it proved perfectly successful. Since then this physician had prescribed no other preparation of bark, and many others had also adopted it. Looking to the therapeutics of the future, he did not think quinine would be superseded, because it was a most

valuable medicine, but he hoped to see introduced the mixed alkaloïds from *Indian* red bark, which would in many cases be more useful. It would be desirable that the manufacture should be undertaken by some firm of established repute, possessing public confidence, because it would be very difficult for pharmacists in general to test it. He found no difficulty himself, because he was accustomed to use the polariscope, by the aid of which he could easily detect the red barks of India, as they possessed, on an average, a molecular rotation of 38° to the left.

MR. BRADY: I should like to ask what is the proper strength of alcohol requisite to form a preparation of the bark.

DR. DE VRIJ: The alcohol should be of a strength of about 80 or 85 per cent. There is one observation I ought to have made, viz., that the Dutch and English are in many respects very much alike. One gentleman asked if it was allowable to use Indian barks for the preparation of the extract, and I am sorry that such a question should have to be put. But unfortunately both nations have done the same thing: they have both introduced the cultivation of bark in their Indian possessions, but neither allowed its pharmacists to use them; and not only so, but they have both lately had an appendix to the Pharmacopœia issued, and in neither is there any mention of the Indian barks.

MR. D. HANBURY read the following paper by Professor Flückiger on "The Stearoptene of Oil of Nutmeg:"—

ON A SUBSTANCE CALLED MYRISTICIN.

BY PROFESSOR FLÜCKIGER, OF STRASSBURG.

From the statements recorded in Gmelin's *Handbook of Chemistry*, vol. xiv., p. 389, it would appear that the essential oil of nutmegs sometimes deposits a kind of camphor. The earliest notice of such a body is due to Johann Friedrich John, professor of chemistry at Berlin, who, in the year 1821, made very extraordinary observations regarding nutmeg-camphor. Thus, according to that chemist, the substance under notice, which he termed *myristicin*, is soluble in water, and even requires not more than 19 parts of boiling water for solution. We know of no other substance of the class of natural stearoptenes or camphors being to any considerable extent soluble in water. But still more astonishing is the assertion quoted by Gmelin, that the aqueous solution of myristicin is "*sometimes acid, sometimes alkaline.*" John even states that myristicin yields

crystallized compounds with hydrochloric or tartaric acids. He, in fact, thought the substance to be a kind of alkaloid, a suggestion which may be excused when we remember the brilliant discovery of cinchonine and quinine which had been made shortly before by Pelletier and Caventou.

I am sorry to have been unable to see John's original paper, in order to ascertain how he obtained this curious camphor.* Nor have I perused that of Bley, whose few observations, however, as found in Gmelin, appear to refer to an impure substance, inasmuch as he says his stearoptene melted above 100°C ., leaving carbon when evaporated.†

Again, in 1839, Mulder examined a crystallized stearoptene, which is also noticed by Gmelin. This substance is likewise said to be soluble in boiling water as well as in *caustic lye*; Mulder assigned to it the formula $\text{C}_{16}\text{H}_{32}\text{O}_5$, and represented it as melting at 112°C . From his paper it appears that he obtained it not, as supposed by Gmelin, from nutmegs, but from the essential oil of mace. As to the latter, there is found in Gmelin an observation of Bley's, according to whom this oil yielded an *emulsion with ammonia*, and a kind of *soap with caustic lye*.

Oil of nutmegs was again examined by Cloez in 1864; and oil of mace in 1862 by Dr. Schacht, of Berlin, and in 1865 by Koller; no one of these observers mentions any stearoptene.

The foregoing statements concerning the so-called *myristicin* induced me to endeavour to procure this remarkable substance; and in this object I was aided by the kind liberality of Messrs. Herrings & Co., of London. In the laboratory of these gentlemen, there was submitted to distillation a large quantity of nutmegs, some of them being of the ordinary kind (*Myristica fragrans*), while others were the *long nutmegs* derived from *M. fatua*. On the third day of the distillation, a crystalline matter was noticed to collect with the oil on the surface of the water.

This was the substance which I received of Messrs. Herrings & Co. It was a greyish semi-solid mass, smelling strongly of nutmegs. By mixing it gradually with cold spirit of wine, sp. gr. 0.830, I found that the crystalline part of the magma might be separated and partially purified by washing with small quantities of

* In the abstract of John's paper as contained in the *Journal für Chemie und Physik* of Schweigger und Meinecke, xxxiii. (1821) 250, myristicin is simply said to be deposited in the essential oil of nutmegs.

† Such is the statement in the English translation of Gmelin.

spirit of wine. The crystals thus obtained have to be further purified by repeated crystallization from boiling spirit of wine. At length large, brilliant, colourless scales were obtained, the crystalline form of which, however, could not be ascertained, the scales being never fully developed; in polarized light they prove to be doubly refractive. The recrystallization was repeated ten or twelve times, yet was ineffectual in removing from the substance the smell of nutmeg. It is, in fact, not possible to deprive it in this way of the odour; yet the odour is gradually lost when the crystals have been kept for some months, although even in a stoppered bottle. They are readily soluble in warm alcohol, crystallizing therefrom when sufficiently pure, even in summer, but separating more readily in cold weather.

The alcoholic solution is devoid of rotatory power; it reddens litmus slowly, but very decidedly and permanently. In water the crystals are insoluble. They melt at 54.5°C ., and evolve offensive vapours, like a fatty substance; if they are heated in a glass tube, no crystallized particles are sublimed. On platinum foil they burn, leaving no residue, giving off at first the same vapours as when heated in a glass tube.

No difference whatever could be observed between the myristicin of *Myristica fatua* and that of the common nutmeg; the ultimate analysis of purified crystals from both sources likewise corroborates their identity. Crystals from *M. fragrans* afforded—

Carbon	. . . . .	75.77
Hydrogen	. . . . .	12.19
Oxygen	. . . . .	12.04
		<hr/>
		100.00

while those from the oil of the long nutmeg, *M. fatua*, yielded:—

	I.	II.	III.
Carbon	. . . . . 75.23	75.66	75.02
Hydrogen	. . . . . 12.30	12.36	12.35
Oxygen	. . . . . 12.47	11.98	12.63
		<hr/>	<hr/>
		100.00	100.00

In caustic alkalies the crystals of *myristicin* dissolve readily; if a somewhat considerable quantity is dissolved in warm caustic lye, it will form, on cooling, a consistent jelly, which, in fact, is nothing else than a *soap*. Myristicin warmed for a day or two with absolute alcohol and an excess of anhydrous carbonate of sodium, yields, on cooling, a gelatinizing *neutral* solution. If this solution is liquefied,

filtered, and mixed with an acid, a crystalline layer will, on cooling, make its appearance on the surface of the liquid. This layer may be collected, washed with water, until the latter no longer reddens litmus, and then recrystallized from hot alcohol, when crystals are obtained which prove to agree in every way with the original *myristicin*. If this process of purification is repeatedly carried on with the same quantity of the substance, the odour of the latter diminishes, and at last disappears.

The crystals thus purified proved, upon analysis, to be composed of—

	I.	II.
Carbon	73.27	73.41
Hydrogen	12.25	12.25
Oxygen	14.48	14.34
	<hr/>	<hr/>
	100.00	100.00

It became now evident, that I had before me *myristic acid*, which, in form of *trimyristicate of glyceryl* is the chief constituent of the fatty part of nutmegs. The formula of the acid, $C_{14}H_{28}O_2$, requires:—

14 C.	168	73.68
28 H.	28	12.28
2 O.	32	14.04
	<hr/>	<hr/>
	228	100.00

The melting point of myristic acid is stated by Heintz to be 53.8° ; my crystals melted not before 54° or 54.5° . Whether this difference is due to the perfect, I may say unrivalled, purity of my acid, or to a different way of observation, may remain undecided.

The *myristicin* under notice is consequently nothing else than myristic acid, accompanied at the outset by essential oil. Whether the same mixture had been examined by John, by Bley, or by Mulder cannot be ascertained. It is obvious that some of their observations would agree with myristic acid, whereas others rather apply to a camphor, the existence of which has not been corroborated.

It is not astonishing to meet with myristic acid in the product of a prolonged distillation of nutmegs, for fatty acids generally are capable of being volatilized, especially by means of superheated steam, when the vegetable fats are resolved into glycerin and fatty acids. I am not aware, however, that special observations had ever been made as regards myristic acid. It is possible that free myristic acid is present in the nutmeg itself, and this would still more easily be

carried over by the watery vapour. I have warmed a little powdered nutmegs with alcohol and anhydrous carbonate of sodium, and thus got a small amount of indubitable soap, from which I isolated myristic acid. This experiment shows that nutmegs contain a little myristic acid in addition to that combined with glycerin. As to the volatility of myristic acid, I may last remark that *lauric acid*, $C_{12}H_{24}O_2$, which is the next in the same series as myristic acid, has been found by G6rgey and by Oudemans to be easily volatilized with steam. Myristic acid may doubtless be a little less volatile.

Myristicate of sodium had not yet been obtained, so far as I know, in distinct crystals; there is, however, no difficulty in preparing it in thin prisms, which are deposited if an alcoholic solution of the salt is allowed to evaporate very slowly. By mixing an alcoholic solution of this salt with an alcoholic solution of acetate of barium, I obtained an amorphous precipitate of *myristicate of barium*, 0.419 gramme of which yielded by incineration 0.142 gramme carbonate of barium, representing 0.0988 of barium, that is, 23.55 per cent. of that metal. The formula $2(C_{14}H_{27}O_2)Ba$ would require 23.15 per cent. The liquid which I separated from this myristicate of barium yielded, after a short time, crystalline scales of another salt, namely, $2(C_{14}H_{27}O_2)Ba + 2H_2O$, which has not been obtained by other observers. This salt should yield upon incineration 31.39 per cent. of carbonate of barium. 0.2055 gramme of the crystals actually afforded me 0.0645 of carbonate, that is to say, 31.38 per cent.

By mixing an alcoholic solution of nitrate of silver with an alcoholic solution of myristicate of sodium, I obtained amorphous *myristicate of silver*, $C_{14}H_{27}AgO_2$, which, by theory, should give 32.24 per cent. of silver:—0.7785 gramme of this salt was found to contain 0.5206 of silver, that is to say, 32.19 per cent.; in a second experiment 0.6450 of the same myristicate of silver left 0.2077 = 32.20 per cent. of metal. All these results are in full accordance with my previous statements, namely, that the crystalline matter separated from oil of nutmegs in the laboratory of Messrs. Herrings & Co., is *myristic acid*.*

The PRESIDENT: Dr. Flückiger has pursued this subject with his usual thoroughness, and we are all indebted to him for so elaborate

* Some of the above analytical results have been ascertained in my laboratory by Dr. Buri.

a paper. It is not a subject of the highest importance, but truth is always valuable. I imagine this crystalline body is often met with by pharmacists in making spirit of nutmeg. I often find a small deposit at the bottom of the bottle, which I have always regarded as stearoptene, but which is probably this myristic acid. I doubt not you will pass a vote of thanks to Professor Flückiger for his paper, which you will please signify in the usual way.

Mr. SIEBOLD: I should like to ask if it be possible to incinerate myristicate of barium without at the same time converting a considerable quantity of the carbonate left into the oxide. Whenever I have incinerated any preparation of barium containing an organic acid, I have always found it impossible to obtain pure carbonate as a residue.

Mr. WILLIAMS: Carbonate of barium stands a high temperature much better than carbonate of calcium, which is apt to become caustic.

Mr. SIEBOLD: Whenever a barium salt containing an organic acid has been heated, I have always found that the residue was not pure carbonate, because the carbon which is present greatly facilitates decomposition.

Professor TICHBORNE: I would suggest that it is very easy to re-carbonate any oxide of barium which is formed, by a little carbonic acid, or water aerated with carbonic acid.

ELECTION OF AN HONORARY MEMBER.

The PRESIDENT: I have a recommendation to make to you with reference to adding to our list of honorary members. We have had the misfortune within two or three years to lose two very important honorary members, Messrs. Procter and Parrish, both Americans. I have now to ask you to elect a Canadian gentleman, Mr. W. Saunders, of London, Ontario. He is well known as a scientific pharmacist, both in America and here, and his communications often appear in our Journal. One was published last week on the insects that attack drugs. I think we may all feel honoured by electing him as an honorary member.

The election was unanimously agreed to.

THE EXHIBITION OF OBJECTS OF INTEREST RELATING TO PHARMACY.

The PRESIDENT then proposed that the following gentlemen should

be appointed a Committee to report upon the exhibition of pharmaceutical matters—Messrs. Atherton, Barnes, Deane, Gale, Giles, Ince, Martindale, Stanford, and Umney.

The names were unanimously approved of.

The Conference then adjourned for luncheon until two o'clock.

On the Conference re-assembling, Professor ATTFIELD read the following paper by Professor Flückiger :—

ON THE CHEMISTRY OF ELEMI.

By PROFESSOR FLÜCKIGER, OF STRASSBURG, HON. MEMBER OF THE PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

Towards the year 1820, George Samuel Perrottet, a Swiss botanist, then a collector for the Jardin des Plantes at Paris, brought to Lausanne, from Manilla, a specimen of the resin of a tree known in the Philippines as *arbol-a-brea*, i.e., *pitch-tree*. The tree is thus called on account of its abundant resin, which is much used in the Philippines for the caulking of boats, for torches, and also in medicine; but the resin does not appear to have been at that time collected for exportation.

At Lausanne this resin was examined by the distinguished chemist, Samuel Baup, who found it to have "*un peu de ressemblance avec la résine élémi*." It is, in fact, nothing else than that kind of elemi which is now largely exported from Manilla, and has long superseded the other sorts of this drug, which had successively made their appearance in the European market. I am not aware of the exact period at which Manilla elemi first reached Europe in large quantities, yet Baup, in his paper, "*Sur les Résines de l'Arbol-a-brea et de l'Elémi*," contained in the *Journal de Pharmacie et de Chimie*, vol. xx. (1851), pp. 321-332, was not of the opinion that Perrottet's specimen agreed with elemi as then found in commerce. We may, however, presume that Baup was no longer thoroughly familiar with the drug market, since he had in 1823 already retired from practical pharmacy. But there is another fact which seems to me in favour of Baup's opinion that the elemi of his time was not that from Manilla. The essential oil of elemi was found in 1841, by H. Sainte-Claire Deville,* to be strongly levogyre, and to yield easily a crystallized compound, $C_{10}H_{16} + 2 H Cl$, whereas elemi of Manilla, which I have repeatedly examined, affords a *dextrogyre* oil, incapable

* *Comptes Rendus*, vol. xii. (1841), p. 184.

of yielding this solid hydrochlorate. This I think, is sufficient to show that in 1841 Manilla elemi was not yet the prevalent sort, or, at least, that Deville's drug was not such. I had the opportunity, on the other hand, of examining a small fragment of the very substance which came into Baup's possession,* and think it agrees with the Manilla elemi of the present market, only differing from the latter in being *black*. This is due to the smoke of the torches which were applied to the tree in order to promote the outflowing of the oleo-resin. As to the *arbol-a-brea*, and its botanical characters, nothing precise and satisfactory has yet been made out.

Among the substances isolated from Manilla elemi by Baup, I shall notice now only those *soluble in water*, which he termed *bryoidin* and *breïdin*. He obtained them in the following way:—As elemi consists chiefly of essential oil, a crystallizable resin sparingly soluble in cold alcohol, and an amorphous resin easily removable by the latter liquid, Baup first boiled the drug with alcohol of 90–95 per cent. On cooling, the colourless crystallizable resin (*la sous-résine*) is deposited, and may be washed with cold alcohol of 85 per cent. These crystals were called *amyrin*, because at that time a Brazilian tree, *Amyris elemifera*, Linn., was thought to furnish the elemi of commerce; and Baup regarded the amyrin obtained from the latter as identical with the crystallizable part of the oleo-resin from the Philippines. The alcoholic solution, separated from the amyrin, was then submitted to distillation, in order to drive over the essential oil and the alcohol. The residue in the still consisted of the soft amorphous brownish resin, and a turbid, aqueous liquid. The latter was decanted, the resin repeatedly washed with alcohol of only 50 per cent. (about .916 sp. gr.); the mixed liquids were then evaporated, to deprive them of essential oil and alcohol. Finally, a brown, oily, aromatic† mass separated and sunk; while, upon cooling, delicate white needle-shaped or moss-like crystals made their appearance, and were termed by Baup *bryoidin*. The liquid, on further evaporation, separated into two layers, of which the heavier proved to contain chloride of potassium and other inorganic salts; the upper thickish layer (resembling the before-mentioned “aromatic” mass) afforded, when boiled with a

* I am indebted for it to Mr. Roux, late pharmacien of Nyon, Lake of Geneva, the author of “*Notice biographique sur Samuel Baup, chimiste*,” in the *Schweizerische Zeitschrift für Pharmacie*, December, 1862. Appendix.

† Its peculiar smell is not at all that of the original essential oil of elemi.

little water, some more bryoidin. These latter crops of crystals, after repeated purification by water, finally gave crystals of a substance which, according to Baup, did not agree with bryoidin, and he therefore distinguished it as *breïdin*.

The characters of the two substances are thus described by Baup—*bryoidin* is a little *bitterish* and somewhat acrid; its silky crystals may be sublimed between two watch-glasses, when they form moss-like tufts. The crystals melt at $135^{\circ}\text{C}.$; they require, at 10° , 350 parts of water for solution. This solution is neutral; acetate of lead, either neutral or basic, produces in it a precipitate. Bryoidin is much more abundantly soluble in alcohol, ether, essential or fatty oils, or acetic acid. With concentrated sulphuric acid it assumes a red colour.

Breïdin, according to Baup, is in prisms, exhibiting angles of 102° and 78° , and terminating in four-sided pyramids; 260 parts of water, at 10° , are sufficient to dissolve one part of *breïdin*; and the solution is precipitated by basic acetate of lead. *Breïdin* is freely soluble in alcohol, not much so in ether. The crystals melt at a little over $100^{\circ}\text{C}.$, and are volatile, like those of bryoidin. These characters are, it will be observed, no very well marked differences between the two substances, and I believe that they are not really different at all.

I am not aware that any chemist attempted to repeat Baup's observations until last winter, when my friend, Mr. Hanbury, caused to be distilled a quantity of Manilla elemi, and took the opportunity of examining the watery liquor remaining in the still for bryoidin. He succeeded perfectly in obtaining this substance in colourless crystals, by a method which we have described in the work on drugs which is about to appear under our joint authorship. Since those observations were printed, I have carried on the experiments a little further, and, after various trials, have adopted the following as the best process for extracting bryoidin, as it appeared evident that weak alcohol is a good solvent of bryoidin. I placed four kilogrammes of elemi in a copper still, and had it gently warmed in the water-bath for a day or two, with 20 kilogrammes of alcohol of $\cdot 972$ sp. gr., that is to say, a weak spirit containing but 22 per cent. of alcohol. The essential oil which came over was separated, and the spirit of wine, from which it was removed, was returned to the still. After this operation had been sufficiently carried on, the still contained a solid resin, and a weak alcoholic solution, A. The resin was now boiled for a day with much water, and afforded another portion of essential oil, which I found to be dextrogyre, like that

obtained by means of dilute alcohol.* The water in the still (*B*) was separated, and the resin warmed with about 12 kilogrammes of alcohol, sp. gr. .830, and two kilogrammes of water. After cooling, the liquid (*C*) contained the amorphous resin, the other resin being deposited in white crystals, agreeing with Baup's *amyrin*.

In order to get bryoidin, I submitted the liquid *A* to distillation, and subsequently evaporated the merely aqueous liquid from which the alcohol had been abstracted. During the evaporation a very small amount of crystallized amyrin, contaminated with a trace of the amorphous resin, first separated. The weakness of the alcohol which had been used prevented any larger amount of resin being dissolved. It is important not to evaporate at once all the liquid *A*, and especially not to allow it to boil. After having tried the preparation of bryoidin in different ways, I came to the conclusion that the best plan is to evaporate on the water-bath small successive portions of the liquid until they begin to yield crystals of bryoidin floating on the surface. The liquid should then be allowed to repose for 24 hours, when the bryoidin can be removed from it, the mother-liquid being reserved for further evaporation. By heating the solutions to full ebullition, bryoidin in itself would evaporate to some extent. By gradual evaporation as just described, it is obtained at once in a state of approximative purity. But if the concentration of the liquid is carried on without separating the crystals as soon as they appear, the final purification of the latter becomes difficult by reason of another principle occurring in elemi. This is a brown bitter substance which is more abundantly soluble in water than bryoidin. In the treatment of elemi just recommended, this bitter substance is contained in the aqueous liquid *A*, together with bryoidin. If this liquid is concentrated, brown drops of the bitter substance separate at a certain moment, and form a thickish resinoid deposit. Now, if the crystals of bryoidin have not been taken out of the liquid, they will be enveloped and thrown down by this resinoid matter, and can only be recovered therefrom with some difficulty.

As to the liquid *B*, I have evaporated it with the same care, and got from it a little bryoidin, yet scarcely enough to repay the trouble. The same must be said with reference to the solution *C*; if this is deprived of alcohol, the amorphous resin separates, but the aqueous liquid proves poor in bryoidin. As a rule, I cannot there-

* See *Pharmacog.*, p. 132, where we already stated another sample of oil of elemi to deviate also to the right hand.

fore recommend to include the liquids *B* and *C* in the process. The whole amount of bryoidin which I have been able to remove from elemi scarcely exceeds 0·3 per cent., that is to say, of nearly pure bryoidin; its appearance in the mother-liquors is much more promising, owing to its extreme lightness and flocculent aspect.

To purify bryoidin, it must be repeatedly recrystallized from boiling alcohol of 22 per cent. At first the solutions are slightly brownish, a little turbid, bitterish in taste, and yield precipitates with tannic acid or with neutral acetate of lead. All this is but due to traces of the bitter principle, for after several recrystallizations, using also a little charcoal, the solutions become colourless, perfectly clear, weaker in taste, and miscible with either neutral or basic acetate of lead, without being precipitated. The final yield of pure bryoidin is unfortunately much reduced by purification. Instead of the voluminous moss-like tufts obtained in the earlier stages of the operation, bryoidin may be at last got in brilliant prisms by allowing the solution to evaporate spontaneously. This is, I think, the substance that Baup called *bryoidin*. I have been unable to find any real difference between it and my bryoidin; under the microscope the prisms display a remarkable tendency to split longitudinally, which is well in accordance with the usual moss-like growth of the substance. The latter shows under the microscope very long, soft, thread-like crystals. In polarized light the crystals are seen to be refractive; they consequently do *not* belong to the cubic system.

There can be no doubt that Baup's observations are correct; yet it is evident that some of the properties he assigned to bryoidin apply to the imperfectly purified substance; his investigation must nevertheless be commended as a remarkably successful one,* when it is considered that he had but very little of the "*resin of the arbol-a-brea*" at his command.

At 135°–136° C., bryoidin melts, and at a more elevated temperature can easily be sublimed; it volatilizes in fact below 100°, so that very nice tufts are produced by exposing it for some days to the heat of the water-bath only. The crystals are anhydrous, giving

* Like many others due to that zealous man; we may quote, for instance, his valuable contributions to the knowledge of quinine, cinchonine, kinic acid, citric acid, aconitic acid, and equivalent numbers. Baup was born 15th May, 1791, at Vevey, on the Lake of Geneva, and died 9th February, 1862, at Lavaux, not far from the former place. In 1816 he paid a visit to London, and saw Brodie and Brande.

off no water, either over sulphuric acid or at 100° C. They are readily soluble in alcohol, bisulphide of carbon, chloroform, ether, acetic acid, also in essential oil of elemi or glycerin; their solubility is not increased by the presence of alkalis or acids. Cold concentrated sulphuric acid slowly dissolves bryoidin, and assumes, when warmed with it, a reddish hue. By cold nitric acid, bryoidin is liquefied, and forms brownish drops not soluble in the acid.

Bryoidin purified by repeated recrystallization and sublimation assumes a fine red colour if it is exposed to dry hydrochloric gas; it is subsequently liquefied, and turns violet, then a most brilliant *blue*, and lastly an intense *green* being developed. The colours are permanent for several days; the liquids are soluble in chloroform, yet I have not succeeded in getting a solid compound by the hydrochloric treatment. These reactions are not at all displayed by amyrrin, the before-mentioned crystallizable resin of elemi. As to the amorphous part of the drug, it turns only a little reddish by hydrochloric gas, probably on account of a trace of bryoidin which it obstinately retains. The essential oil of elemi, if saturated with anhydrous hydrochloric gas, assumes a dark violet tint.

I have failed in ascertaining satisfactorily the solubility of bryoidin in water. I found one part of it to be contained in 384 parts of a solution saturated at 28°–30° C.; but another solution prepared at 25° C. afforded one part of bryoidin in 492 parts. A solution prepared by boiling water with bryoidin in excess, and then allowed to remain for a week that the crystals should deposit, yielded one part in 523 parts of the solution. In every case the solutions were carefully concentrated at a temperature not exceeding about 70° C., and then fully evaporated over sulphuric acid. The loss of bryoidin to any appreciable amount was thus avoided. I think the discrepancies are due to the formation of supersaturated solutions.*

In boiling water, bryoidin is not much more soluble than in cold, for 200 parts of it are able to dissolve but one of bryoidin; of alcohol 22 per cent. (0.972 sp. gr. at 15° C.), 147 parts dissolve one of bryoidin at 28° C., yet much more when warmed. The solutions taste aromatic.

The analysis of bryoidin afforded on an average, carbon, 74.21 per cent., and hydrogen, 11.52 per cent; these numbers may refer to the formula, $C_{20}H_{38}O_3$, namely:—

* To this circumstance may be due the remarkable separation of *flocks*, described in our *Pharmacographia*, p. 134.

			Analysis.
20 C	.	240 equal to 73.62	74.21
38 H	.	38 „ 11.65	11.52
3 O	.	48 „ 14.73	14.27
<hr/>			<hr/>
		326 100.00	100.00

Thus bryoidin may be regarded as a hydrate of the essential oil contained in elemi, that is to say, as answering to the composition— $2 (C_{10} H_{16}) + 3 H_2 O$; yet it must be borne in mind that it contains no water of crystallization. By submitting it to sublimation it undergoes no alteration, as already proved by its melting point remaining the same as before, namely, 135° – 136° C. This view is supported by the composition of amyrrin, which I believe to answer to the formula, $C_{20} H_{34} O$. This substance might be regarded as $C_{20} H_{22} + H_2 O$, and bryoidin, $C_{20} H_{32} + 3 H_2 O$; there can be but little doubt that elemi will also afford the intermediate compound, $C_{20} H_{32} + 2 H_2 O$.

In its general behaviour, bryoidin resembles terpin, $C_{10} H_{16} + 3 H_2 O$, the crystallized hydrate of essential oil of turpentine, or rather of the substance $C_{10} H_{20} O_2$, which is obtained when terpin, by melting, parts with $H_2 O$, that is, losing 9.47 per cent. This anhydrous terpin melts at 150° , and is soluble in 200 parts of cold, or 22 parts of boiling, water, and freely soluble in all alcoholic or ethereal liquids. There are, however, great differences between bryoidin and terpin. By boiling the latter with very little dilute sulphuric acid, *terpinol*, $C_{20} H_{34} O$, a fragrant liquid, is formed. No such thing is produced with bryoidin. Nor is terpin coloured by hydrochloric gas. Again, if bryoidin is brought into contact with acetyl chloride, a very energetic action and effervescence takes place, whereas terpin quietly dissolves, so does likewise amyrrin.

Bryoidin and terpin agree inasmuch as they are volatile and, in solution, devoid of rotatory power, although both these compounds are derived from essential oils, $C_{10} H_{16}$, which possess that optical characteristic.

It would appear possible that the constituents of elemi may be allied thus:—

Essential Oil	.	.	.	.	$C_{10} H_{16}$
Crystallized Resin (elemi or amyrrin)	2	$(C_{10} H_{16}) + H_2 O$			
Amorphous Resin (?)	.	.	.	.	2 $(C_{10} H_{16}) + 2 H_2 O$
Bryoidin	.	.	.	.	2 $(C_{10} H_{16}) + 3 H_2 O$

But further researches are needed to prove the correctness of this suggestion.

The *bitter substance* already mentioned is by no means abundant in elemi, though it appears to be present to a somewhat larger amount than bryoidin. I have in vain endeavoured to isolate from it a well defined compound. The resinoid brown mass, which at last separates from the concentrated aqueous solutions, *A* or *C*, has a very intensely bitter, and at the same time aromatic, non-acrid taste. The latter reminds one of orange peel, and is certainly due to the substance itself, not to essential oil of elemi. An entirely different and strong odour is evolved by the bitter mass, if it is boiled with dilute sulphuric, nitric, or hydrochloric acid. In this case, the odour is somewhat suggestive of melon, caraway, or especially of a fresh terebinthinous varnish. By this treatment with acids, the bitter taste disappears; I have not been able to ascertain whether sugar is, at the same time, produced, because the brown bitter mass would appear already to contain some sugar, seeing that it is capable, to a small extent, of reducing alkaline tartrate of copper. If the bitter mass is warmed with a moderately concentrated mineral acid, it assumes an intense violet or blue colour, and is also coloured in the same way by dry hydrochloric gas. From a solution in dilute alcohol, the bitter semi-fluid mass is partially thrown down by absolute alcohol; yet this precipitate proves to be by no means a pure substance. Its aqueous solution is partly precipitated by tannic acid or by neutral acetate of lead, another portion remaining unaltered in solution. I have failed in removing from the bitter substance the inorganic matters which, as shown by incineration, it largely contains. Baup was well aware of the large amount of mineral substances occurring in the extracts of elemi; in fact they appear to constitute the chief amount of the brown bitter deposit.

The PRESIDENT: This paper of Professor Flückiger's is another instance of his laudable zeal in pharmaceutical chemistry. Elemi is a resin now very rarely used, but I think it might often replace to advantage the common resin. We are very glad to hear the chemistry of it, and we must thank Professor Flückiger for so fully investigating it. I beg to propose that you accord to Professor Flückiger a vote of thanks for his paper.

The vote of thanks was carried.

Mr. D. HANBURY: It is rather difficult to follow the details in a paper on this subject, and therefore I may perhaps be excused for making a remark with the object of simplifying some of the explanations given. When I prepared the substance on the table, I

was not aware of all the facts subsequently discovered by Professor Flückiger. I obtained bryoidin by simply evaporating the watery liquid in the still, after obtaining the essential oil of elemi. In this way, I got colourless crystals, which, by a little special manipulation, were obtained in a state of comparative purity. One of the most interesting characters of bryoidin is the easy way in which it sublimes. If you put a little of it into a watch-glass, cover it with a piece of window-glass, and then hold it over the flame of a lamp or a candle for a few moments, the substance will collect upon the upper glass in beautiful minute crystals. Professor Flückiger alludes to the curious separation of *flocks* which takes place, and I may perhaps explain what it is. When you obtain a crystallization of bryoidin from water, there is of course a mother-liquor left, and when it is poured off and filtered, you have a perfectly clear solution; if you heat this solution, it immediately becomes turbid, and deposits what look like pieces of white paper or wool. It is a curious circumstance, and occurs, I suppose, through the supersaturation which is alluded to. If you examine this substance, it will be seen to consist of filamentous crystals which do not redissolve either by heating or cooling. With regard to amyrrin, that is easily prepared, not only from Manilla elemi, but from other varieties. If you take the elemi of South America or Mexico, and treat it with cold spirit of wine, a white matter separates, which is wonderfully crystalline, and may be readily purified and obtained in distinct crystals: that is amyrrin, and, as far as we know, is the same in the elemi from these different sources. It is a beautiful example of crystallizable resin, and one that may be easily investigated by students.

NOTE ON POMEGRANATE ROOT-BARK.

BY DR. J. E. DE VRIJ.

Dr. de Vrij then called the attention of the Conference to the different opinions existing as to the efficacy of pomegranate root-bark. Formerly the bark collected in the South of France or in Italy enjoyed a good reputation. Some were of opinion that the real root-bark had gradually been substituted by the stem-bark. Others were of opinion that fresh root-bark ought to be used. Others supposed that only the root-bark grown in India was efficacious. Lately he (Dr. de Vrij) heard in a meeting of physicians the assertion that only the extract made in India from fresh root-bark was efficacious. As he did not agree with all these opinions,

and his own opinion was that all *real* root-bark, wherever collected, is efficacious, he used root-bark collected by himself, in 1863, in Java, and consequently eleven years old, to prepare an extract by percolation with cold water. He obtained 40 per cent. of extract, of which 56 pills, each of one grain, were sufficient to expel a tapeworm nine metres long. Every quarter of an hour seven pills were administered, so that the cure was terminated within two hours.

Mr. W. W. STODDART: Dr. de Vrij's paper is very valuable in two particulars: first of all it is a singular thing that we in Bristol use the pomegranate bark rather extensively, especially with foreigners who come to Bristol, and who use it for dysentery. I should like to ask if the head of the tapeworm came away in the specimen shown?

Dr. DE VRIJ: Yes; it has been examined.

Mr. W. W. STODDART: In the second place, I have to thank Dr. de Vrij for corroborating my view, which I mentioned here two or three years ago, with reference to percolation. You get the powder, mix it up into a thin cream, put it into the percolator, and then put water on the top. When I mentioned that process before, several gentlemen thought it was not practicable, but I am glad to find that Dr. de Vrij agrees with me that it is the proper mode of percolation.

The PRESIDENT: We will not diverge into the question of percolation, which would last us a whole day, but Dr. de Vrij has done very much to rehabilitate the character of this pomegranate root-bark, and we are very thankful to him for his experiments. He says it is not necessary to use the fresh root-bark, although that has been the opinion of many. Only the other day my brother wrote to me with regard to the Italian herbs in popular use, saying that their idea was that the root-bark, to be efficacious, should be fresh; that, however, appears to be erroneous. It is really wonderful to me that the tapeworm should exist at all, considering the number of remedies we have, and it is to be hoped that some day we shall abolish the animal altogether.

Mr. HANBURY: We must remember that it has not its sole habitat in man, but has a variety of homes to which it can retire to get out of the way.

Dr. DE VRIJ: I should like to know if tapeworm is very frequent in England.

Mr. W. W. STODDART: It is very.

Dr. DE VRIJ: I supposed it must be so, because I notice that you like to eat underdone meat. I have never suffered from tapeworm, but I have known those who do, and who are accustomed to eat underdone meat, and therefore I asked if it was frequent in England.

Mr. W. W. STODDART: I can speak positively on the subject, because some experiments were made in Bristol some six years ago upon it. I had then an opportunity, from the house in which I lived, of seeing a butcher's shop; and it was there a very frequent occurrence for the boys to cut off bits of meat and eat them raw; and it was also a curious fact that those boys had often suffered very much from tapeworms. Besides that, Dr. Brittan, Physician to the Bristol Infirmary, some time ago took up the subject, and prepared a paper upon it for the Microscopical Society of Bristol. He told his colleague he wished to find out whether eating raw meat induced tapeworm; and on a certain morning he gave to several patients attending the infirmary two drachms of the extract of male fern, and directed them to come back on a certain morning, and if any of them had passed tapeworms, to bring them. The result was that there was something like two buckets full of tapeworms. The patients were principally cooks, and, upon being questioned, they confessed they were in the habit of cutting off bits of raw meat and eating them before cooking. This corroborated Dr. Spencer Cobbold's observations that tapeworm did not arise so much from eating pork as from eating beef.

Dr. FRAZER: The subject of tapeworm has attracted a great deal of attention lately in Ireland, but until I began my researches hardly any tapeworm was known there, except the one derived from the swine, the *Tenia solium*. It was very rarely that one met with the *T. medio-canallata*, and in one case only, and that a very remarkable one, was there found a *Trichocephalus*. The case was remarkable, because the person affected had never been out of the United Kingdom. I may say authoritatively that, if properly used, the *Filix mas* extract is undoubtedly a perfectly effectual cure, though the worm is not expelled alive, but dead.

Mr. SIEBOLD: The comparative merits of the various remedies for tapeworm have been discussed many times, and there seemed as many different opinions expressed. But Dr. Küchenmeister, who is one of the greatest authorities upon the subject, maintains that the cortex radicis granati is the most successful of all. He recommends the use of a fluid extract, prepared by repeatedly exhausting the bark by water, and concentrating the united filtrates by

evaporation. Certainly, his experiments show a very remarkable degree of success. Still there is no doubt the male fern and its preparations are exceedingly valuable. But there seems to be a vast difference between the *Filix mas* which we keep in our shops, and the fresh article. There is a woman living in Hamburg, who advertises to cure every one of tapeworm within twenty-four hours, and she does certainly do so, for I have known scores of cases where people who had made many unsuccessful attempts to discharge the worm went there, and came back completely cured. Her secret is only, I believe, that she cultivates in her own garden the *Filix mas*, and administers it in its fresh state, and I have never heard of a single failure. The worst remedy of all seems to be kousso, which generally causes the worm to be discharged in small pieces without the head.

Mr. HANBURY: I do not understand how the fresh rhizome can be administered.

Mr. SIEBOLD: I believe it is scraped with a knife so as to get a kind of coarse powder or paste, then an infusion is made with warm water, and after the infusion is cool, more powder is stirred in. I cannot state that positively, because all my knowledge is derived from patients, who, of course, are not very familiar with the *modus operandi*. I may add that the dose of oil of male fern given in the Pharmacopœia seems very small; it is only fifteen to thirty minims. I believe one or two drachms are required as a rule to produce a successful result.

REPORT ON THE CHEMISTRY OF THE ACONITINES.

I. PREPARATION OF THE ALKALOIDS.

By T. B. GROVES, F.C.S.

The sum of £10, voted for the above purpose, and derived from the fund, was intended to be expended mainly on the preparation of sufficient crystalline nitrate of aconitine, to justify Dr. C. R. A. Wright in undertaking an exhaustive inquiry as to its true chemical constitution. Enough of the pseudaconitine had already been prepared by me and exhibited at the Bradford meeting of this Conference.

Messrs. Hopkins & Williams having kindly offered to perform the preliminary operations, one cwt. of a fine sample of roots of *Aconitum Napellus* was purchased, and entrusted to them for that purpose.

On February 20th, I received from them the acid washings of the crude ethereal solution of the whole alkaloid matters of the

roots soluble in that menstruum. The process adopted was a modification of that of Stas.

The bulk of this fluid having been reduced from one gallon to $1\frac{1}{2}$ pint, it was digested with animal charcoal, alkalized with ammonia, and thoroughly washed with ether. The ethereal solution so obtained, shaken with half a fluid-ounce of nitric acid diluted with eight ounces of water, gave an aqueous solution of the alkaloids of acid reaction, which was allowed to evaporate spontaneously to a thin syrup. It showing no disposition to crystallize, a few crystals of nitrate of aconitine, reserved from the sample I made several years before, were sprinkled on its surface. Crystallization soon commenced, and was allowed to proceed until the mother-liquor became densely syrupy. A second crop was obtained, but the whole not amounting in the crude state to one ounce, it was thought advisable to commence operations on a second cwt. of roots. No sooner was the order given than Messrs. Hopkin & Williams set to work with most praiseworthy promptitude, and I found that when I wrote in haste, two days afterwards, to countermand the order, I was too late. The reason of my doing so was this—my residual mother-liquor had suddenly thrown down a mass of crystals that made what was previously liquid semi-solid.

These crystals were mostly needle-shaped, and of microscopic dimensions. Under thin glass, they appeared, after a time, to undergo change of form, and assume the rhombohedral shape characteristic of the aconitines.

These crystalline cakes were now set aside to be worked up with the proceeds of the second cwt., and the mother-liquors were bottled for the same purpose, a little ether being previously added as a preservative.

On February 28th, I commenced the treatment of the second batch, which arrived in the state in which it left the still, after recovery of the spirit—an acid liquid measuring two gallons, with an oleo-resinous stratum measuring three pints floating on its surface. This latter was removed and washed. Ammonia having been added to the clear liquid, it was well washed with ether, and proceeded with as previously described.

The alkaloid so obtained required five fluid-drachms of nitric acid for neutralization, and when set aside began to crystallize at once. I attribute this improvement to greater expedition in treating the liquid, and the avoiding of undue dilution.

Two considerable crops of crystals were obtained, and, by mode-

rate washing and careful application of the press, were rendered nearly white.

Before proceeding to recrystallize these cakes, it was thought advisable to purify the last cake obtained from the first cwt. These fine silky crystals had entangled so much of their mother-liquor that the cake had become superficially brown. The yield was but small, about one-third of what I expected.

The recrystallization of the whole yielded 13 drachms of presumably pure nitrate of aconitine. That it was unfortunately not so, will appear hereafter.

Treatment of the Mother-Liquors.—The whole of the mother-liquors were now mixed, well diluted, and rendered slightly alkaline with ammonia, so that it could be perceived by its smell. The dark coloured alkaloid thrown down was separated by filter, and dried in air. It weighed about four drachms, and was when dry perfectly black.

The filtrate, containing an abundance of alkaloids precipitable by larger doses of ammonia, was now neutralized with hydrochloric acid, and evaporated to a small bulk. When approaching the volume of 10 ounces, it appeared turbid, and when allowed to cool it deposited a stratum of a transparent, syrupy substance or varnish, measuring about two ounces. This matter was soluble in water, but not in its mother-liquor, except by the aid of an excess of hydrochloric acid. On heating the solution it immediately became turbid, and redeposited the varnish, which when the liquid cooled, was again taken into solution.

After a good deal of experiment, which I need not repeat, I found that the precipitation of the varnish was determined by the presence of muriate of ammonia in sufficient quantity to form a dense solution, in which, when hot, this hydrochlorate was insoluble.

The varnish thus obtained was, as far as possible, freed from contamination by muriate of ammonia, diluted with water, in which it dissolved, and set aside for the night. In the morning it was found to be full of well-defined, colourless crystals, which, separated from the mother-liquor, washed, pressed, and recrystallized, were obtained pure. They evidently formed the crystalline portion of the varnish, the residue being for the most part, in all probability, an amorphous modification of it. These crystals weighed between two and three drachms. They were not very soluble in cold water. Their *dilute* solution was not precipitated by either ammonia, liquor potassæ, or carbonate of potash, except on the application

of heat, when the alkaloid separated as a thick coagulum, fusible in boiling water. It was precipitated by iodo-mercurate, by tannin, and by acid nitrate of silver. The alkaloid was soluble in ether and chloroform. The muriate crystallized readily from hot solutions in fine needles, which were but feeble polarizers, except in the case of a few larger crystals that formed at the edge of the slide.

Their taste was purely bitter and devoid of acidity. Colour reactions with sulphuric acid, ditto plus nitric acid, nitric acid, and chromic acid could not be obtained in them.

A moderately strong solution, warmed with powdered muriate of ammonia, became turbid, and, the heat being continued, deposited the whole of the alkaloid in well-defined crystals. This test seems to be of some value. It answers also when applied to the nitrate.

I have no doubt that this substance constituted the greater portion of the third crop of crystals from the first cwt. of roots.

The varnish, after several solutions and precipitations, became denser and darker in colour.

The supernatant liquor on each occasion showed signs of containing alkaloid, but considerably less in the last than in the first.

They were all mixed, and a rather strong dose of ammonia being added, an alkaloid was thrown down, that when dried seemed to be possessed of very considerable acidity—at least so I judge from involuntary experiments made upon my eyes and nose.

The remaining alkaloids were washed out with ether, which, when evaporated, left a fusible transparent alkaloidal substance similar to that obtained from *Aconitum ferox* under the same circumstances, and which has been incorrectly termed Napellin.

Examination of the Nitrate of Aconitine.

It will be remembered that one of the characters of pure crystallizable aconitine was this, that when its ammoniacal solution was heated to boiling point (care must be taken that it does not actually boil), it deposits well-formed crystals of the alkaloid.

Presuming that my new product would do the same, the experiment was tried on 30 grains. The result was *nil*. Tried again on a much smaller scale, there still was no result. Examined microscopically, it was evident that there were two sorts of crystals present, one resembling true nitrate of aconitine, the other composed of radiating needles. Seen by help of polarized light, the former polarized splendidly, the latter scarcely perceptibly. Compared with the nitrate of aconitine prepared by the iodo-mercurate process, its colours were decidedly more brilliant.

There was a similar difference observable between the pseud-aconitines. That made by the iodo-mercurate process crystallized in rhomboidal plates, which were fairly good polarizers. That made by Stas' process, of which I have one and a half ounces for experiment, showed few of these rhomboidal shapes. It crystallized with difficulty in groups of very long needles, that measured at least one third of the width of the slide, and it polarized much more beautifully than its twin brother, though I afterwards observed that lapse of time seemed to make them approximate.

After consultation with Dr. Wright, it was thought advisable to attempt their purification by converting them into iodo-mercurates and regenerating the alkaloids.

This was done in the usual way, with 100 grains of each substance. As soon as the nitrate of aconitine so obtained was set aside to crystallize, a considerable number of colourless, stout, transparent needles, arranged in stars, made their appearance, and increased in number and size till the next day, when crystals of another character beginning to show themselves, they were removed and purified by recrystallization. They weighed nearly 20 grains, and proved on examination to be the nitrate of the unknown alkaloid of which the muriate has already been described.

Its crystals, viewed as they were obtained, showed here and there only a trace of colour when examined by polarized light; but when a strong solution was allowed to crystallize under thin glass, both their shape and character entirely changed. They closely resembled those of aconitine, and were brilliant polarizers. Although apparently inert, they form, I have no doubt, one of the aconitine series—perhaps are the active principle found in *Aconitum heterophyllum*, by Mr. J. Broughton, the quinologist, and named by him atisine.

The roots from which my alkaloid was obtained were imported from Germany, and from inquiries kindly made by Mr. Holmes, I learn that there is no reason for suspecting that the Indian *A. heterophyllum* was mixed with it.

Aconitum heterophyllum, called in India "atees," is sold everywhere in the bazaars as a popular bitter tonic. It possesses no acidity whatever.

From experiments I have made with the uncrystallizable alkaloids of *Aconitum ferox*, I believe that this bitter alkaloid is present there also in small quantity.

The nitrate of aconitine now crystallized out in hard but small crystals, attached to the sides and bottom of the vessel. Micro-

scopic examination, however, showed that they were not quite pure, and on trying their degree of solubility in ammonia water, it was found that, instead of 520, they required only 460 parts for solution; and again, that on heating this to boiling point, no crystals were obtainable. It was decided, therefore, not to be sufficiently pure for chemical purposes.

The regenerated pseudaconitine, when its ethereal solution was set aside, commenced to crystallize in about an hour, by depositing on the sides of the beaker brilliant rhombohedra. As the liquid became more concentrated these increased in number, but at the same time a crystalline crust crept up the sides, and had from time to time to be scraped down into the liquid. Its crystallizing tendency had, as in the case of the nitrate of aconitine, been very much improved by the process. Crystallized from spirit of wine under thin glass, it showed no tendency to form the long needles I have mentioned as characteristic of its original condition; but, on the other hand, there were present some very suspicious tufts that evidently were not pseudaconitine. The rest of the substance crystallized very nicely and polarized splendidly. Its solubility in ammonia water was tried, and found very much less than it should be. Its employment had, therefore, also to be given up.

These processes had consumed a great deal of time, and the meeting of the Conference was rapidly approaching. Feeling that it would be impossible to purify the alkaloids sufficiently for Dr. Wright's examination prior to the meeting, I determined on sacrificing my old specimens of aconitum and pseudaconitine, made originally by the iodo-mercurate process, and presumably pure. I had just sufficient for two combustions of each alkaloid.

Dr. Wright, at considerable inconvenience to himself, undertook the work, and, after a short time, sent me his results, which were indeed surprising.

All three alkaloids, aconitine, pseudaconitine, and the bitter alkaloid, furnish identical or very closely corresponding centesimal numbers. It would be premature to publish these numbers before Dr. Wright has had opportunities of repeating and varying his experiments; but, so far as he has gone, he has obtained good evidence that these substances, so widely differing, both chemically and physiologically, are either isomers or polymers, most probably the latter.

The researches of Dr. Wright on the polymerides of morphia and codeia reveal many examples of complete change of physiological character caused by polymerization, but I doubt whether the drop

from aconitine to a substance apparently inert will ever be exceeded or equalled. Mr. Broughton has this day informed me that he is quite certain that his alkaloid does not give the same centesimal numbers as aconitine. My alkaloid, in that case, must be quite distinct from atisine.

Since our last meeting, Dr. T. R. Frazer has published some results on the physiological action of crystalline aconitia and pseudaconitine. He found that a very remarkable and exceptional difference of toxicity for different species of animals existed; for whilst aconitia was for frogs about five times more powerful as a toxic agent than pseudaconitine, the latter substance was for rabbits about twice as powerful as the former. It was ascertained that this difference depended on aconitia possessing a more energetic action on the heart, and a less energetic action on the respiratory movements, than pseudaconitine.

PROFESSOR BENTLEY: It is my pleasing duty as Vice-President to move a cordial vote of thanks to our President for the further admirable report which he has just read, for those who are familiar with the meetings of the Conference in former years know very well that this is only one of the series. I cannot of course speak as a chemist, but all who have had an opportunity of discussing this subject will agree with me as to the great accuracy and originality of those papers. We have been told to-day that it would be the work of a lifetime to investigate opium, cinchona, or digitalis, and I am sure all here will hope with me that our President may long live, and will give us many further reports of his investigations into the aconite bases.

The vote of thanks was passed unanimously.

MR. HANBURY: I much regret that Mr. Broughton is not in the room, for I had hoped he would have been here, and have told us something about the alkaloid he has obtained from the root of *Aconitum heterophyllum*,—which is called "*atis*" in India—and which he has not yet described in print. I think the name "*atisine*," provisionally placed on Mr. Grove's phials, is rather doubtful, inasmuch as we are not all sure that the substance is the same as that which has been obtained by Mr. Broughton in India from the true *atis*.

THE PRESIDENT: I am not at all certain about the name, or that this substance is the same, but I showed some slides under the microscope to Mr. Broughton last evening, and he thought they were similar, and, from what he remembered of the chemical re-

actions, I have a very strong doubt whether mine is really a new thing. I certainly do not want to claim it unless it is, because it would be unpleasant to withdraw such a claim. However, it is very interesting to find that the muriate of aconitine should be so powerful a poison, while this is directly the contrary.

Mr. HANBURY: I should like to ask what evidence you have that it is inactive on animals?

The PRESIDENT: The evidence is that I have taken it myself in half-grain doses, and that it has had no effect whatever; it is simply bitter.

The next paper read was:—

THE OFFICIAL PLASTERS.—IMPROVED FORMULÆ FOR THEIR PREPARATION.

By A. W. GERRARD.

Dispenser and Teacher of Pharmacy to University College Hospital.

From a knowledge of the unsatisfactory character of most of the forms given for the preparation of the official plasters, I was induced to undertake a number of experiments with a view to their improvement.

My principal reason for attempting this work is the hope that at some future day the compilers of that book with which our calling is more closely associated than any other, may deem it necessary to give these preparations their attention.

The official plasters are fourteen in number, and will be treated upon in the order of their sequence, with the exception of cantharides plaster, which I hope to make the subject of a future special communication. I may inform you that I have made a number of experiments upon this plaster, but as they are not yet concluded any remarks would be premature.

Emplastrum Ammoniaci cum Hydrargyro.—The ingredients of this plaster are ammoniacum, mercury, olive oil, and sulphur. The first part of the process for its preparation is to dissolve the sulphur in the oil. This forms what is known as balsam of sulphur, and is then used for the extinction of the mercury. When this is accomplished, it is added to the liquefied ammoniacum, and mixed well.

In the Pharmacopœia instructions, too much is left to the judgment of the manipulator; the means of the liquefaction of the ammoniacum, and the necessary provision of straining, being omitted.

Solution of the ammoniacum may be effected by heat, water, or alcohol. Water is the most economical, one pound requiring twelve ounces of water, heating in a water-bath, straining through muslin, and finally evaporating to a plaster consistence. This plaster, as supplied by wholesale druggists, is sometimes so soft, that when spread upon calico it cannot be rolled for fear of sticking together; at other times so hard that when rolled and unrolled it cracks into a multitude of minute fragments, which at once separate from the calico. Two causes may be ascribed for this: one the amount of evaporation the strained ammoniacum has received; the other and most important, the kind of gum resin used in its preparation.

There are two varieties of ammoniacum in the market; one in hard brittle distinct tears, the other in softish masses of agglomerated tears, containing a large amount of impurity. In my experience, the best plaster is made from the tears. I find, after evaporating the whole of the water from the softer kind, it is then too sticky to make a good plaster.

Doubling the quantities of sulphur and oil for reducing the mercury would be an advantage, as saving time. I also find the addition of some yellow wax is an improvement, rendering the plaster more pliable.

The following is the form I would recommend:—

R. Ammoniacum, in tears	10 ounces.
Water	8 „
Yellow Wax	2 „
Mercury	3 „
Olive Oil	4 drachms.
Sulphur	16 grains.

Heat the oil and sulphur together, stirring until they unite; with this mixture triturate the mercury until globules are no longer visible; dissolve the ammoniacum in the water by means of a steam-bath, strain, and evaporate the strained product to the proper consistence for a plaster; add the wax, and, when melted, stir in the prepared mercury, and mix thoroughly.

Emplastrum Belladonnæ.—This is one of the most important and best of this class of preparations, and I believe the most frequently prescribed; when correctly prepared, it is a valuable topical application. In the last London Pharmacopœia it was ordered to be made by mixing together equal parts of extract of belladonna and soap plaster—a proceeding not easy to accomplish, unless by the addition of water; on evaporating this water a large portion of the extract,

probably the chlorophyll and albumen, separated to the bottom of the vessel, changed to a brown colour. Perhaps from a knowledge of these defects, the authors of the B.P. deemed it advisable to alter the formula to the following:—

“R	Extract of Belladonna . . .	} of each 3 ounces.
	Resin of Plaster . . .	
	Rectified Spirit . . .	
		6 fluid ounces.

Rub the extract and spirit together in a mortar, and when the insoluble matter has subsided, decant the clear solution, remove the spirit by distillation or evaporation, and mix the alcoholic extract thus obtained with the resin plaster, melted by the heat of a water-bath.”

The originator of the above no doubt intended it to be of the same strength as the P.L. plaster; if the spirit accomplished a thorough exhaustion of the active principles of the extract—which it does not by a long way—it really would be stronger, as the London Pharmacopœia extract contained the albumen, but the B.P. extract does not.

The present form was badly devised, and cannot be commended, either as an economical or a pharmaceutical achievement; it was a little advance in the right direction, but still not what it might have been. Is it not waste of labour and material to prepare one extract from another, and that inefficiently, when the materials are at hand for its direct preparation?

Following are some experiments I made upon the dry root and leaf of belladonna, exhausting them with rectified and proof spirits; also upon extract of belladonna, exhausting it with rectified spirit; the object being to determine which yielded the best and most economical plaster.

Twenty-five drachms of dried belladonna leaf were coarsely powdered and macerated in half a pint of proof spirit for 24 hours, then transferred to a percolator, and treated with a pint of proof spirit, and displaced with water; the product was evaporated, and yielded six and a half drachms of softish extract = 26 per cent. This extract did not mix well with lead plaster.

Three samples of dried root, treated as above, yielded respectively 25·5, 26·3, and 28·0 per cent. of extract, being a mean of 26·6 per cent. This extract mixed better than the above with the lead plaster, but required a good deal of stirring to accomplish it.

The same quantities of each of the above roots and leaf were treated with rectified spirit; the leaf gave 7½ per cent. of extract, and the aggregate yield of the root was 5 per cent.

250 grains of extract of belladonna gave, with 500 minims of rectified spirit, $42\frac{1}{2}$ grains of extract = 18 per cent.

Most of the above results have been verified by a note to me on the subject by Mr. Umney.

The greatest yield of extracts as would be expected, was obtained from the proof-spirit exhaustions, but as I have before stated, they do not mix well with lead plaster, and must be passed over as unsuited for my purpose. It therefore remains to decide between the alcoholic extracts of the leaf, root, and watery extract. The last-named gives the greatest apparent result, but a little consideration of the subject will demonstrate that it is otherwise. 700 parts of fresh plant yield an average of 32 parts of official extract, and this official extract yields, with rectified spirit, 6 per cent. of extract of uncertain alcoholic strength. Now, 700 parts of fresh plant, equal 100 of dried, and this yields, with rectified spirit, $7\frac{1}{2}$ per cent. true resinous extract; so that in one case, where the extract is used, the plant yields 6 per cent. of extract, of a strength somewhere between proof and rectified, and in the other, when the dried leaf is used, we obtain $7\frac{1}{2}$ per cent. It is, therefore, obvious that the dried leaf is to be preferred to the watery extract. It now remains to decide between the merits of root and leaf. Economically, the leaf is the best, it giving $7\frac{1}{2}$ per cent. of resinous extract against 5 from the root, but the more important consideration is their respective therapeutic value. To decide this question, I shall quote from a paper of M. Lefort, "On the Distribution of Atropine in the Leaves and Roots of Belladonna," which was copied in the *Pharmaceutical Journal* of June the 2nd, 1872. He thus speaks on the subject:—

"Except in atropine, the composition of the leaf was far from resembling the root of the belladonna; and this is a fact important to be remembered when it is sought to compare their physiological and therapeutic properties. In former experiments, the dried leaf was found to contain 3 per cent. of a fatty matter coloured by chlorophyll, giving off strongly the odour peculiar to the poisonous Solanaceæ. The dried root does not contain more than 1 per cent. of this matter. The nature of this poisonous principle, and the part that it plays in the preparations that contain it, is a subject worthy of investigation.

"Without doubt plants produce upon the animal economy physiological effects as much more decisive as their chemical composition is more pronounced, but it must not be forgotten that their special therapeutic properties are often as much due to the combined action of the constituent principles as to the predominance of one, so that,

considering the difference existing in the composition of the belladonna leaf and the root, it is difficult to make a comparison between them as to their therapeutic action, and they should rather be looked upon as relatively than absolutely similar.

"The principal conclusions of the author as affecting this subject are (1), that in general composition the root differs notably from the leaf; (2), that though the root is frequently richer in atropine than the leaf, the proportion is much more variable, and therefore the leaf would have more uniform therapeutic properties."

These results with my own experiments, I consider justify me in deciding that a resinous extract of the dried leaf of belladonna is a more correct and uniform representative of the plant than the root, and therefore would be the best to use in preparing this plaster. The form I propose is the following :—

R.	Dried Belladonna Leaf	50 parts.
	Rectified Spirit	a sufficiency.
	Lead Plaster	a sufficiency.

Macerate the belladonna leaf with 50 parts of spirit for 34 hours, pack in a percolator, and exhaust with more spirit; distil or evaporate the spirit until of a proper extract consistence. To every part of this extract add 11 parts of lead plaster, and dissolve by the heat of a steam-bath, and mix well.

I have mentioned rectified spirit for the exhaustion of the belladonna, but this is an instance in which there can be no reasonable objection to the use of methylated spirit. I have compared the extracts prepared both ways, and cannot distinguish them.

We have a belladonna plaster in the University College Hospital Pharmacopœia, introduced by Mr. Martindale, and prepared with a resinous extract of the root, as suggested by the late Mr. Balmer, from which excellent results are obtained; the proportions are one of extract to nine of lead plaster. This is, I think, rather too strong, as it frequently produces an unpleasant eruption upon the patient. The same effect, even to a more marked extent, has been produced from a plaster of the same strength, prepared from the leaf, so that I considered it advisable to reduce the proportions as above.

The United States Pharmacopœia orders its belladonna plaster to be prepared by exhausting one pound of root with spirit, and adding the resulting extract to make one pound with lead plaster: this does not give uniform results, the yield of extract varying from three to eight per cent.

Emplastrum Calefaciens.—This plaster was originally in some of

the older editions of the London Pharmacopœia, but was omitted from the latter, probably on account of the small particles of Spanish-fly it contained causing too much irritation, it being made with powdered cantharides and Burgundy pitch. For this reason, on its introduction to the B.P., the method and materials of its preparation were wisely changed. It is now made by exhausting cantharides with boiling water, evaporating, and mixing the result with expressed oil of nutmeg, yellow wax, resin, soap plaster, and resin plaster. The expressed oil of nutmeg is an elegant addition, but it and the wax together weaken the adhesiveness of the plaster. To remedy this, the soap plaster present might be substituted by resin plaster, as it is the most adhesive. I have found this an improvement. The formula would then be as follows:—

R.	Cantharides, in coarse powder		
	Expressed Oil of Nutmeg	.	} of each 4 ounces.
	Yellow Wax	.	
	Resin	.	
	Resin Plaster	.	5½ pounds.
	Boiling Water	.	1 pint.

It is matter for regret that no better means have yet been adopted for the exhaustion of cantharides in the preparation of plasters than the wasteful processes at our disposal. Acetic ether would be an improvement upon anything in present use, and probably for this purpose it is now official.

Emplastrum Cerati Saponis.—This plaster is made by boiling together vinegar and oxide of lead until they have combined, then add soap, and boil again until most of the moisture has evaporated; finally add wax and olive oil melted together, stir well, and continue the heat until, by the evaporation of the remaining moisture, the product is of the proper consistence for a plaster.

This was originally in the L.P. as soap cerate, and was first classed among the plasters in the B.P. 1864, to which preparations it more correctly belongs. It is a curious combination of ingredients involving several chemical changes for its preparation. In the first place boiling the vinegar and oxide of lead together yields subacetate of lead; to this is added the hard soap or oleate of soda, which decomposes a portion of the lead salt, forming oleate of lead and acetate of soda, then is added olive oil and wax, the olive oil decomposing another portion of subacetate of lead, forming oleate of lead, glycerin, and free acetic acid.

This plaster contains a larger proportion of lead than any other in the Pharmacopœia, and essentially consists of oleate and acetate

of lead. The method I adopt for its preparation differs from the B.P., in that I use eighteen ounces of acetic acid instead of the gallon of vinegar. Practically I find this the correct quantity to dissolve the oxide of lead; it also yields a more uniform plaster, and saves about two hours in the process.

The spread plaster of this preparation is a great favourite with some surgeons, and, when spread upon a special material, is the principal ingredient of what is known as dreadnought plaster.

Emplastrum Ferri is prepared by mixing hydrated peroxide of iron with melted Burgundy pitch and lead plaster.

This is used as a strengthening plaster, but its value may more correctly be attributed to the protection and mechanical support it affords, than to any tonic effect of the iron.

Prepared as above, and spread during the hot weather, it takes some days to dry, the surface loses its gloss, and is covered with a greyish film. I find the omission of the Burgundy pitch obviates this, and improves the plaster.

If a good coloured plaster is desired, a dark coloured oxide of iron must be used. That which has been subjected to a strong heat is the best, and pale coloured oxides may be thus changed; it should be passed through a fine sieve before mixing with the other ingredients.

Some plaster makers have used the resin of dragon's blood for improving its colour; this practice is now, I believe, abandoned.

Emplastrum Galbani.—This is seldom used, and samples I have prepared of it are satisfactory; all I have to suggest is that the same instructions be given for dissolving the gum resins as I have pointed out for ammoniacum and mercury plaster.

Emplastrum Hydrargyri.—In this plaster the proportions of olive oil and sulphur might be doubled with advantage; otherwise it is satisfactory.

Emplastrum Opii.—Prepared by mixing one part of opium in fine powder with nine parts of resin plaster. The above is the form of the last Dublin Pharmacopœia; in the L.P. it was made from extract of opium, lead plaster, and frankincense. The substitution of resin plaster for lead plaster and frankincense is an improvement, but I should have preferred the continuation of extract of opium. The powder of opium, on mixing with the resin plaster, has a tendency to agglomerate into particles which are difficult to separate, and when spreading, it cannot be kept equally diffused through the plaster; the particles are also likely to irritate. The mixing of a watery extract of opium with resin plaster is, however, not to be

accomplished unless some intervening agency be employed, and I find glycerin to answer the purpose; each ounce of extract requires half an ounce each of glycerin and water. When thus prepared, it mixes readily with the resin plaster, and yields a smooth, uniform, and comparatively elegant preparation.

Calculating opium to yield half its weight of extract, the form would stand thus:—

R	Extract of Opium	1 ounce.
	Glycerin } of each.	$\frac{1}{2}$ „
	Water }	
	Resin Plaster	18 ounces.

Dissolve the extract in the glycerin and water by a gentle heat, mix this with a small portion of melted resin plaster, gradually add the remainder, and stir well.

I have no doubt that a resinous extract of opium would be most compatible with resin plaster, but, in choosing the watery extract, I have borne in mind that it more nearly represents the combined constituents of opium than the former.

Emplastrum Picis.—Pitch plaster is seldom or never used as a strapping, but generally spread upon leather for local application. The water in the present form serves no purpose, so that it might be omitted.

Emplastrum Plumbi.—This is the most extensively used plaster of the Pharmacopœia, forming the principal basis of nine of the fourteen. It is prepared from oxide of lead, olive oil, and water. On mixing these ingredients and applying the necessary heat, the fatty acids, assisted by the steam generated from the water, decompose the oxide of lead, with the formation of oleate of lead, glycerin is set free and partly carried off by the steam. If the whole of the water be evaporated, the plaster becomes opaque, assuming a velvety appearance; the source of heat should then be removed, as when it arrives at this point it is in the best condition for spreading.

In the London, Dublin, and Edinburgh Pharmacopœias, the proportions of its ingredients were very approximate; the United States Pharmacopœia orders one-fifth more oxide of lead. In the first B.P., the proportions were altered by reducing the oxide of lead about one-fifth. The reason for this is said to be its previous deficiency in adhesiveness. It certainly was hard and brittle, and required some alteration, but as it now stands it errs in the opposite direction, by being too soft and sticky. I will allow that the present plaster can be made harder by adding more water and continued boiling, but this is at the cost of labour, time, and fuel, which the

addition of a little more oxide of lead would economize, and yield a superior product.

From a large number of experiments I have decided that the following proportions give the best plaster, and, in deciding upon these, I have borne in mind that its principal requirements are adhesiveness and flexibility :—

℞ Oxide of Lead, in fine powder	. . . 6 pounds.
Olive Oil	. . . . . 10 pints.
Water	. . . . . 4 „

Boil these ingredients together gently by the heat of a steam-bath, stirring constantly until they unite and acquire the proper consistence for a plaster ; more water may be added during the process if necessary.

The B.P. instructions are to simmer four or five hours, made as above, in a proper steam-pan ; one hundredweight can be completed in an hour and a half.

Good fresh Italian oil only should be used, as it produces a superior and more pliable plaster than any other kind.

A very good lead plaster can be made from nut oil, which I believe is used by some makers ; a sample I prepared from it appeared equally as good as that made from olive oil. As to its adhesive and keeping properties I have no experience, but believe, considering nut oil is less prone to rancidity than olive oil, it would be found quite equal, if not superior, in these respects.

Emplastrum Plumbi Iodidi.—The form for this plaster is the worst in the series, and reflects no credit upon its author ; had it been submitted to a practical pharmacist for preparation before it was made official, it never would have disgraced the Pharmacopœia.

Though made with iodide of lead, it contains scarcely any, it being nearly all decomposed by the soap present in the soap and resin plasters with which it is mixed ; the fatty acid of the soap combining with the lead to form lead plaster, and the soda of the soap with the iodine to form iodide and iodate of soda. The resulting plaster, instead of being bright yellow, is of a whitey-brown colour.

To improve this formula, all that is necessary is to omit the soap and prepare as follows :—

℞ Iodide of Lead, in fine powder	. . . 2 ounces.
Resin	. . . . . 1½ „
Lead Plaster	. . . . . 1 pound.

Melt the resin and lead plaster, then stir in the iodide of lead.

Emplastrum Resinæ.—This is the best and most adhesive strapping plaster in the Pharmacopœia, forming, when spread upon good stout linen or calico, an excellent preparation for the surgeon's use.

The B.P. proportions do not give a good plaster all the year round; spread during the cold winter weather it is satisfactory, but in the hot summer weather it is so sticky that it cannot be rolled without spoiling. To overcome this difficulty it is necessary that the plaster spreader should use his judgment in apportioning the resin according to the season of the year. My experience in this matter—and I have spread some thousands of yards of the plaster—is to use the B.P. form in winter, in the spring use half, in the summer and autumn one-fourth the quantities of soap and resin ordered in the official form. I have always found this give the greatest satisfaction.

Next to a good plaster, the material upon which it is spread is of importance. A stout linen sheeting that has been partly worn, so as to deprive it of its stiffness and dress, is from long experience found to be the very best material for the surgeon's and operator's use. From its pliability it has the property of adapting itself to the irregularities of a limb without the formation of folds or creases to irritate and annoy the patient.

Mr. T. Bryant in his work on "Surgery," in speaking of the value of a good strapping for the treatment of indolent ulcers, says, "It should be spread upon good stout linen instead of the sleazy material usually sold." Next to linen a very good material is calico of a kind called the Croydon finish. This is very good and cheap, but is not quite so strong and adhesive as the linen.

A very good plaster for ordinary use, may also be spread upon what is called pillow calico. This has a linen finish, and would be scarcely known from linen.

Emplastrum Saponis.—This plaster is generally used for the same purposes as the foregoing. It differs from it in containing more soap and less resin, and is therefore less adhesive. Its special uses as compared to resin plaster I am not acquainted with, and as far as my experience extends, there seems no necessity for alteration.

Mr. Gerrard then went on to say:—

Now that I have finished my review, before I leave you I feel desirous of introducing to your notice the existing apparatus (so far as my knowledge extends) used for plaster spreading. Here is a machine invented by Mr. Martindale. I will not enter into a minute description of its parts, but for the information of those who require it, they will find it in the *Pharmaceutical Journal*, vol. ii., p.

33. Any one who understands the principles of its construction, with a little practice may soon learn to spread plasters, but let him not attempt it unless he makes up his mind to spoil the first fifty yards.

Here is another machine for making what I define as hand-spread plasters. It is composed of two tressels, the top rails, which are eighteen inches wide, being studded with tenter hooks at intervals of $1\frac{1}{4}$ inches. These tressels are placed at a distance apart equal to the length of plaster to be spread; the ends of the linen or calico are then fixed on the tenter hooks, and strained tight by pulling a tressel; a portion of melted plaster is then poured upon the linen at one end, and drawn along its surface by the edge of a thick spatula; this operation is repeated a second and third time, when the plaster may be trimmed and removed from its frame. That is a pharmaceutical operation, which, perhaps, you have never before witnessed; it has however been practised in a large metropolitan hospital, viz., Guy's, for upwards of a century, and is still in use. This method of spreading requires even more practice, and certainly more skill and dexterity than the former; it nevertheless might be found useful to some, as the cost of the apparatus is trifling.

Besides what I have shown and told you, there is a large amount of technical knowledge required for the successful practice of plaster-making and spreading. This is only to be acquired by frequent practice, such as the general pharmacist cannot be expected to obtain. For these reasons, this branch of pharmacy must remain to a large extent a speciality.

There is one more subject I desire to touch upon. It is that of shaped marginal plasters upon leather. Most of us know how well those of some makers are spread, but how this is accomplished we, or at least I, am at present in the dark.

I have often thought what a great convenience it would be in a pharmacy, if instead of the unsatisfactory plaster spatula we now use, some cheap and simple apparatus could be devised for spreading shaped plasters in a neat and workmanlike manner. I therefore suggest that the Executive of our Conference could not better dispose of any surplus funds than by offering a portion as a premium for such an invention.

In conclusion, the results I have arrived at, and the suggestions I have made with reference to plasters, were obtained in each case from several experiments, varying the proportions of material. I do not wish to force upon you that they yield the very best results,

for I am but a novice, and know that my experience in the subject is limited as compared with others. There may be those here to-day who have something to contribute to what I have stated, or whose experience differs with mine. If these expressions succeed in withdrawing their knowledge from its solitude and conservation, they will be the means of lending a helping hand to the progress of pharmacy.

The PRESIDENT: We are highly indebted to Mr. Gerrard for the very conscientious way in which he has worked out his subject, and I am sure Mr. Hills would be greatly pleased, were he here to see what the result of spending his money has been. To properly discuss this question would take a long time, but I think it would be better, if we attempt to do anything of the sort, to do it methodically, and to take each plaster separately. But I will first ask you to pass Mr. Gerrard a vote of thanks.

The vote of thanks was passed unanimously.

The PRESIDENT: The emplastrum belladonnæ will probably offer more scope for discussion than the first one on the list. The great objection to the present emplastrum is its messiness; it is such a dark green colour, that if it at all flows beyond the margin of the leather, it soils the clothes of the patient. I should have been glad to have heard that the root could be properly used instead of the leaf, so as to avoid the green colour produced by the chlorophyll, though I do not much believe in any plaster myself, except the emplastrum cantharidis.

Mr. MARTINDALE: I have had a little experience in making this plaster according to the formula which I introduced into the University College Hospital, altered from that of the B.P., on account of the disadvantages Mr. Gerrard has pointed out. Making an extract of an extract is a very wasteful mode of making a plaster. I took the Hospital formula from Mr. Balmer, who published a paper in the *Pharmaceutical Journal* some years ago for making it with an extract prepared from the root of the belladonna. Remembering the good effects of the liniment so made, introduced by Mr. Squire, Mr. Balmer thought this would be a better preparation than anything made from the leaf or from the crude extract. He himself told me, that he had derived great relief from the application of such plasters. I accordingly adopted it, and I used the strength he gave for some time at the University College Hospital, I think it was one part of the alcoholic extract of the root to two or three of lead plaster; but it was complained of, that it pro-

duced an eruption almost similar to that of scarlet fever. The physiological action it produced—that of dilating the pupil of the eye—when applied externally being so powerful, in many cases I desisted from making it so strong, and with the sanction of the Dispensary Committee, reduced it to one part to nine. Mr. Gerrard now says, that even this has been found in some cases too strong, and raises an eruption when persons are at all subject to any erysipelatous tendency. It may therefore be necessary in some cases to make it more dilute. Lead plaster, which makes it sufficiently adhesive, is to be preferred to resin plaster, as the resin may assist in producing the eruption sometimes complained of. With regard to the merits of the two kinds of plasters made with alcoholic extract from the leaf, and that made from the root, I think one great objection to that prepared from the leaf is that it is a deeply-coloured plaster. In the Pharmacopœia process the alcohol naturally absorbs the colouring matter of the extract; and although I believe that chemists prefer it with the bright green colour, it is very disagreeable to the patient who has to wear it. I therefore prefer it made from the root, and seeing the good effect of liniments so produced, I cannot see any advantage in the preparation from the leaf. I believe, as a sedative plaster in allaying pain of various kinds, especially in affections of the heart, it is very valuable.

Mr. HAMPSON: I entirely agree with what Mr. Martindale has said, and having had some experience in making belladonna plasters from the root and from the leaf, I am inclined to think—in fact I am sure—that that prepared from the root is better in every respect.

Mr. MARTINDALE: I should like to ask Mr. Gerrard if it is quite correct where he says, that when the oxide of lead is dissolved in vinegar in making *emplastrum cerati saponis*, a solution of subacetate of lead is produced?

Mr. GERRARD: The calculated proportions of lead and acid would leave a subacetate.

The PRESIDENT: With regard to the *emplastrum opii*, perhaps some gentleman can offer an opinion as to the relative merits of the powder and the extract.

Mr. MARTINDALE: There is a great advantage in using the extract if it can be mixed in the way Mr. Gerrard has suggested. I have not tried the experiment of dissolving it in glycerin, and getting the solution to mix with the basis; but if it does mix it will be a decided improvement over the use of powdered opium, because, as Mr. Gerrard has pointed out, in spreading such a plaster you are apt to get the powder agglomerated together in particles.

Mr. GERRARD: There is a sample of each of the plasters on the table.

Mr. GILES: From my experience I prefer the plaster in the form in which we now have it, by reverting to the old Pharmacopœia process, using the powder instead of the extract, as being much more convenient to make. I cannot say that operating in the small quantities one requires for one's own use, I have found any difficulty in mixing in the powdered opium, though it may be a difficult matter in making a large quantity. But you have a considerable difficulty in mixing the extract, and I must therefore say I was very glad to find that we had reverted to the old method.

The PRESIDENT: If you use the extract it is important to have it well diluted, because if you try to mix it up too stiff, you cannot do it.

Mr. UMNEY: With regard to the emplastrum plumbi, I look upon the present proportions given in the Pharmacopœia as a mistake. The proportions given in the London Pharmacopœia, as far as I can remember, would be about five parts of litharge to nine by weight of olive oil; but in the B.P. the litharge has been decreased to four parts, and herein I think is a very serious error. In fact, almost all the plasters of the B.P. on this account are too sticky, and I think a much better plaster can be prepared by using the formula of the London Pharmacopœia; it is too, in my opinion, a better basis for other plasters.

Mr. MARTINDALE: With regard to this plaster, as I have said before in this room, the Pharmacopœia directions are somewhat vague, and I should like to hear the best mode of getting rid of the aqueous moisture, and also of the glycerin contained in it. Makers generally like to send it out opaque, white and free from discoloration; though, in my opinion, it should never be white, but of a somewhat translucent appearance, something like ordinary fresh yellow resin; it is only when we get it evaporated to that consistency that it is in a fit state for spreading by a machine. Mr. Gerrard can corroborate me that it is impossible to try to spread a plaster such as is generally sent out by wholesale druggists by a machine; it contains too large a quantity of water and some portion of glycerin, and unless they are evaporated out by continued stirring and heat, it is impossible to get the plaster when passed through the machine, or even when spread by hand, to take the cloth; it will not "bite," and you often get a large piece in the centre which is not coated at all. I should like to know if it would be well to pour the plaster, when nearly finished, into a large quantity of water, and knead it so as to wash out the glycerin.

Mr. GERRARD: My own experience is that the heat can be continued after the union has taken place between the oil and the lead until the whole of the moisture is evaporated. The plaster then assumes a semi-opaque appearance; it retains a little glycerin but that is not at all a disadvantage. The larger portion passes off with the steam, and the small portion which remains is, according to my experience, an advantage, because it renders the plaster more flexible; too much, however, retards its adhesion. In the plaster sent out by some wholesale houses, the object seems to be to retain as much water as possible.

Professor REDWOOD: I should like to make one observation with respect to the subject now before us, the *emplastrum plumbi*, mainly arising from what has fallen from Mr. Umney, who has referred to the alteration made some years ago in the proportion of oxide of lead and olive oil. That alteration was made after a very considerable investigation of the subject, mainly amongst those practically engaged in making plasters upon a large scale. One remark of Mr. Umney's tends rather to confirm the propriety of the conclusion then come to, for he stated that the plaster is rendered more sticky in consequence of the alteration in the proportions. Now, that is the very object that was contemplated. You are probably aware that many years ago there was a plaster much used in London, known by the name of Dr. Scott's plaster; it was, in fact, a plaster used by a medical man celebrated in wound cases at that period. It was much sought after by many persons, and for a considerable time there was a good deal of mystery as to the way in which it was prepared. It was sufficiently adhesive, but was entirely devoid of the ordinary source of stickiness in adhesive plaster. The object contemplated in the alteration referred to was to give to the plaster a certain amount of adhesiveness without the addition of resin. That has been accomplished by the alteration in the proportion of the ingredients, and it certainly is more sticky. Mr. Squire has just reminded me that I omitted to notice one element in the new plasters, namely, long boiling. That, together with the increased proportion of oil, are the means by which the *emplastrum plumbi* is, as we conceive, now produced, which possesses adhesive properties.

Mr. GILES: I think what has been said is a very sufficient answer to the remarks made with regard to *emplastrum plumbi* as a plaster standing by itself, but it leaves us in the same embarrassment with reference to the production of this plaster as a basis for other plasters. Undoubtedly the consequence of the change has been to

make the other plasters of the Pharmacopœia inconveniently sticky and, as a matter of fact, I believe wholesale houses have modified the form, and that we do not now get them strictly according to the B.P. I do not know that there is any harm in that, but in a future edition it might be advisable to introduce an emplastrum adhesivum where a sticky plaster is required, and the old emplastrum plumbi as a basis for other plasters. I recollect a great many years ago, noticing a peculiar plaster which is used in France under the name of adhesive plaster; it is much softer than our own, and excessively sticky, and it has this great advantage, that you can apply it with facility to a sore and can take it off again. It is a very useful plaster in many cases in surgery.

The PRESIDENT: Does that French plaster contain much resin? Because that would be rather an irritant constituent.

Mr. GILES: I do not know.

The PRESIDENT: The next plaster on the list is the emplastrum plumbi iodidi. In one of the plasters exhibited on the table, undoubtedly the ordinary iodide of lead is not present, but it may be more efficient than the other.

Mr. MARTINDALE: I think the explanation given with regard to the iodide of lead plaster is scarcely that which either Mr. Gerrard now states or Dr. Redwood gave some time ago in this room. I believe the lead plaster dissolves the iodide of lead without decomposition, and that the decolorization is not so much due to the soap which it contains as it is to the lead plaster. If a little more heat had been applied I think Mr. Gerrard's yellow plaster here would become quite colourless. I once tried the experiment, and though I should like to repeat it before speaking positively, I found I got the iodide of lead dissolved by the lead plaster, and that it became decolourized just as much as the Pharmacopœia plaster.

Mr. GERRARD: My experience of that plaster is that if the lead plaster is made according to the B.P., an excess of oil being used, the iodide of lead is really decomposed with the addition of soap or resin, and more especially so with the Pharmacopœia lead plaster than with one made with a large proportion of litharge. It is very curious that in the combination which takes place no iodine is evolved.

Professor REDWOOD: There is no doubt that the present formula for preparing iodide of lead plaster is a mistake. I believe, of course, that the iodine is present; and it may be in as active a condition as if it remained iodide of lead, but the very fact that the plaster changes its colour is an objection. The reason why the other plaster

was ordered in that formulary was, that it makes a plaster which retains its flexibility better. The one made smooth with lead cracks very easily, whilst one made with soap retains its flexibility.

Mr. MARTINDALE: I believe it was first intended to be an iodine plaster, but it was found, in making it, an iodide of lead plaster was formed, and that it became like the ordinary lead plaster in colour. In giving directions for another iodide of lead plaster, I think clear instructions should be given, so as to get the iodide of lead, if soluble, dissolved in the lead plaster, and not to have that uncertain changeable yellow colour. With regard to the emplastrum resini and emplastrum saponis, I do not see why they should both be retained, as they contain the same ingredients, only in rather different proportions. It is inconvenient to have to keep stocks of so many different kinds of plasters which are seldom used.

The PRESIDENT: I think the emplastrum saponis is a redundancy. It is generally kept about until it will no longer stick to the calico, and then it is thrown away.

THE APPLICATION OF OLEIC ACID IN PHARMACY.

By C. R. C. TICHBORNE, PH.D., F.C.S., ETC.

The alkaline salts of oleic acid (soaps) used in pharmacy form a valuable and important class of preparations, and yet they are all procured by circuitous routes, at an extraordinary expenditure of time and money, but with an unsatisfactory result. Once upon a time (and not very long back) oleic acid was a chemical curiosity, valueless in the arts, and very little known, except to the scientific chemist. Now this is all past, and the acid is manufactured of considerable purity by the ton, and at a price before which no fats or oils suitable for pharmaceutical work could compete. Why this substance has not been made available in pharmacy is not so curious as might appear at first sight. It will be found from the experiments detailed that the so-called oleic acid of commerce presents some slight difficulties as regards its manipulation.

The first and only suggestion of importance that I am aware of for the use of oleic acid in pharmacy was Professor Attfeld's paper upon the solution of the alkaloids in this acid, to be used in conjunction with cod-liver oil. These preparations have now gone out of use, and therefore a most valuable suggestion has fallen through. There cannot be two questions about the elegance and practicability of this method, and wherever a powerful alkaloid,

such as aconitia in ung. aconitiæ is to be mixed with a fatty body, we should use the oleate. We thus obtain a solution in the fats, not a mechanical mixture.

There has been a second application of oleic acid, oleate of mercury; but from its appearance and other causes I do not think it will ever be much used.

I have had a series of experiments made with the view of practically introducing this so-called oleic acid, or the liquid fatty acid, of commerce into the preparations where soap is introduced.

Many of the experiments so made, seemed at first to be unpromising; but as they were theoretically correct, they were persevered in until many excellent formulæ, as regards the appearance and general results, were produced.

In speaking of oleic acid as found in commerce, Messrs. Price & Co. gave me the following information, which, I think, will be of sufficient interest to note here. There are one or two qualities in commerce, the best of which is known as pale cloth oil. The brown German oleic acid when bought by the ton is extremely cheap, but is much inferior in quality to the oil known under the above name or brand. It is, of course, a kind of by-product, procured by the splitting up of palm or other oils by superheated steam into glycerin and the fatty acids. The stearic acid and hard fatty acids are used in the manufacture of candles and for other purposes, whilst the fluid portion is pressed out, and is the article known as oleic acid of commerce. Although the oleates are perfectly harmless providing the base is so, the acid itself would appear to be therapeutically a poison. Thus, Messrs. Price & Co. point out that, although rats and mice are passionately fond of all neutral fats and oils, they carefully avoid oleic acid. It would be useful to determine how far this is the fact. Externally it seems to produce an irritability of the skin when used unneutralized.

It is my intention, on this occasion, to consider its application to the liniments, a class of preparations in which the oleates form an important part.

The soaps of the Pharmacopœia are as follow:—1. The hard soap, "Castile soap," supposed to be a hard soda soap made from olive oil, but very uncertain in its composition.

2. Soft soap.—An olive oil soap made with potash.

3. Animal soap, "curd soap," supposed to be a soda soap made with tallow, as uncertain in its composition as the Castile soap.

The oleates, or soaps with which we have to do in this paper, I may as well describe in a concise manner, but it is necessary to bear

in mind that this description applies to the oleic acid products as made from the commercial acid.

If we consider oleic acid as a bibasic acid, the formulæ of the soaps will be $C_{36}H_{66}M''O_4$. The oleates differ from the palmitates and stearates in being perfectly soluble in alcohol—a most important point when considered in connection with liniments. The neutral oleate of ammonium is a very pectous salt, capable of a very considerable amount of dilution before it gains a liquid consistency.

The oleate of sodium is practically insoluble in the cold, only a small proportion remaining dissolved, and the mass of it being deposited in a granular condition, or as a curd. It dissolves in weak spirit. The oleate of potassium is very soluble in cold water, and pectizes easily.

I might enlarge upon this portion of my subject, but prefer to give a general outline of the practical application of this acid to the production of the liniments.

I may mention that the oleic acid, called "pale cloth oil," is admirably adapted for the production of liniments, but the acid does not improve by age, and very old samples do not pectize so easily as new ones; I may mention that the colour may be improved by digesting with pure animal charcoal.

Linimentum Ammoniacæ.—This preparation, the old "oil and harts-horn," is, in the first stage of its existence, an emulsion of olive oil in the presence of an excess of ammonia. By degrees the oil is slowly saponified until we get nothing but a semi-solid ammonium soap.

I should prefer to make this liniment in the following manner:—

R.	Oleic Acid	.	.	.	.	.	.	.	5ss.
	Water	.	.	.	.	.	.	.	5ij.
	Strong Solution of Ammonia	.	.	.	.	.	.	.	3jss.

Mix the water and oleic acid, and add the solution of ammonia gradually, but with agitation.

The result will be a liniment having a definite and unchangeable composition.

Lin. Potassii Iodidi c. Sapone.—This preparation in the Pharmacopœia is a solution of iodide of potassium with an insoluble oleate of sodium, and glycerin, etc. Nothing can be more unmanageable than this formula, and yet it is a useful addition to the medical practitioner's list. It is a powerful stimulating liniment, which can be used by ladies where tincture of iodine is not desirable. It has not come into more general use simply from the great uncer-

tainty and ugly appearance which this curds-and-whey-like preparation presents. I propose to make it in the following manner:—

R	Oleic Acid	6 ounces.
	Carbonate of Potassium	2 "
	Iodide of Potassium.	7½ "
	Glycerin	5 "
	Oil of Lemon	5 drachms.
	Water	2½ pints.
	Solution of Potash, a sufficient quantity.	

Dissolve the carbonate of potassium with heat in 10 ounces of the water, and add the oleic acid; and after the effervescence has subsided, add the iodide of potassium, glycerin, and oil of lemon, mixed together, and then a sufficient quantity of the solution of potash to make it the requisite consistency, which it does by virtue of its power of producing a pectizing oleate.

Linimentum Saponis, B.P.—This has been a much-abused formula, and deservedly so. In this liniment a soda soap acts an important part, and as the fatty acids which are found in the ordinary soap of commerce are only partially soluble in spirits of wine, it only contains a minimum of the soap used. It is supposed to be a fluid liniment, and not a jelly like the original opodeldoc, of which it is a copy. If we obey the directions as regards temperature in making this liniment by maceration for seven days, we get a partial solution of the soap, and the stearates and other fatty salts are left, amounting to a large percentage.

My formula would be as follows:—

R	Oleic Acid	8 ounces.
	Carbonate of Sodium	4 "
	Camphor	5 "
	Oil of Rosemary	12 drachms.
	Rectified Spirit	3 pints 12 ounces.
	Water	8 "

Dissolve the carbonate of sodium in the water with aid of heat, and add gradually the oleic acid; when the effervescence has subsided, add the oil of rosemary and camphor dissolved in the spirit, and filter if necessary.

The advantages are that we have a formula that contains all the soap in solution and in a perfectly neutral state; for if any excess of carbonate of sodium has been used, it is precipitated by the spirit. We are also enabled to make the liniment in as many minutes as it required days by the old process.

There are certain liniments which may be viewed as emulsions. *Linimentum terebinthinæ* is typical of their preparation. Oleic acid behaves beautifully in such liniments.

Linimentum Terebinthinæ—

R	Oleic Acid	1 ounce.
	Oil of Turpentine	16 „
	Camphor	1 „
	Solution of Potash	q. s.

The camphor and oleic acid are dissolved in the turpentine, and the solution of potash is added gradually, with constant agitation, until the whole emulsifies.

I do not pretend for a moment that these formulæ are the best that can be devised in connection with the use of oleic acid; but I do say, and have no hesitation in saying, that the days of the old formulæ are numbered, and that any one who makes the saponaceous liniments from oleic acid will never return to the soaps. I may, in conclusion, mention that no objection can be raised to oleic acid on the score of cost, as it will easily compete with the soaps in that respect. There are other applications of oleic acid which I must reserve to a future occasion. I have preferred to restrict my remarks to one class of medicaments.

The PRESIDENT: This is my first introduction to Professor Tichborne, but I hope we shall often have the pleasure of seeing him here again. His paper contains a great deal of interesting matter which well deserves the attention of the next Pharmacopœia Committee, whether that committee is composed partly of pharmacists and partly of medical men, or wholly of medical men. The subject is certainly worthy of further experiments; and I have no doubt many gentlemen who read the paper will further investigate the subject. I have now to ask you to pass a vote of thanks to Professor Tichborne.

The vote of thanks was passed unanimously.

Mr. FRAZER: I may state, as showing that Professor Attfeld's suggestion has not altogether fallen to the ground, that our principal oculist in Glasgow had considerable difficulty in the application of aconite, and applied to myself to get a solvent for it. I applied to Mr. Morson, and he advised me to have it dissolved in oleic acid; and now, for a considerable time, it has been in daily use for this purpose by Professor Reid, lecturer on diseases of the eye in the University of Glasgow.

Professor ATTFIELD: I must say that I cannot altogether claim originality in suggesting the dissolving of substances in oleic acid, because when some seven or eight years ago my method of dissolving alkaloids in oils was published, I had brought to my notice the fact that some one, I forget whom, had fifteen or twenty years before, stated that alkaloids could be dissolved in fatty acids.

Mr. SCHACHT: There is one observation I should like to make with reference to this paper, namely, that although one might see the desirability of employing oleic acid in the place of olive oil in the manufacture of soap, I could not help thinking it would be desirable, in most cases at least, that a definite compound should be first of all prepared rather than attempt to extemporize this formula at the moment of use, because the chances are, we should not get so perfectly neutral a preparation as would in many cases be desirable. But I wish to speak of that peculiar, and according to my experience very useful, preparation, the liniment of iodide of potassium and soap, which I believe owes its paternity to Messrs. Smith, of Cheltenham. A very satisfactory result was obtained by the use of one particular kind of soap—one which, I believe, contains very little oleate of soda, but a large proportion of stearate of soda, the curd soap of Messrs. Benbow. When that is used, you certainly do get a charming preparation, one which resembles clotted cream in consistency more than anything else. It is very constant, and maintains its consistency very perfectly for a great length of time, and you can produce the same article invariably by using the same materials. Of course, it is an open question whether much effect is produced by the external application of iodine in any form: if it is to be applied; however, this is a very elegant preparation. But if any one attempts to make it with oleate of soda, they will get a wretched result, neither solid nor liquid.

The PRESIDENT: Are you quite sure that the soap you refer to is a stearate soap, and that it contains no cocoa-nut oil? Because the cocoa-nut oil soaps have this property, that they can be dissolved in saline solutions, whereas stearate soaps cannot.

Mr. SCHACHT: I know that the oleic soap produces a very bad result, but I cannot speak absolutely with regard to cocoa-nut oil.

Mr. MARTINDALE: As oleic acid mixes well with alcohol, I think it might be suggested that it should be used in belladonna and aconite liniments in place of the camphor, as it would aid their absorption, and make them more compatible with liniments generally. It mixes with them, but not quite so well unless it be pure, and there is great difficulty in getting it of sufficient purity. With

regard to the statement that all oxides dissolve in it, I have tried oxide of iron, and cannot get it dissolved in any way. It would be a great advantage if you could get oxide of iron dissolved in oleic acid, in order to mix with cod-liver oil.

The PRESIDENT: According to my experience the best way of dissolving peroxide of mercury in oil is to rub up in a warm mortar equivalent quantities of bichloride of mercury and powdered olive oil soap, and afterwards add a little boiling water to produce reaction and form the oleate. I have thus got a nearly white mercurial plaster that dissolved readily in hot oil, and kept well without turning black. By heating peroxide of mercury with the oleic acid I employed, I obtained a plaster that speedily became slate-coloured from reduction.

Mr. UMNEY: The specimen of oleic acid placed on the table by Professor Tichborne is far superior to any we see in trade in England at the present time. I believe many specimens would be better described as oxy-oleic acid; at any rate, that with which one meets is many shades darker than the specimen before us, and might be described as of a deep sherry colour.

Professor ATTFIELD: In reply to Mr. Martindale, I may say that oxide of iron is very slightly soluble in oleic acid; I dare say insufficiently so for any preparation to be used in pharmacy. With regard to varieties in the quality of oleic acid, I have seen some samples used in large quantities quite as good as that on the table; though, no doubt, the bulk of that met with in the trade is much darker. Oleic acid is now produced on an enormous scale, and is extensively used by clothworkers. As is well known, oils and fats of many kinds, which were formerly thrown away, being so impure as to be almost useless, are now "recovered," and thus an immense amount of oleic acid is thrown into trade. The better varieties, of course, command higher prices than the darker, but still there is a large quantity of light-coloured oleic acid to be had at a fairly reasonable rate, far more than is ever likely to be used in pharmacy.

Mr. RIMMINGTON thought the smell would be objectionable. The samples now shown had a peculiar smell, and so had every specimen he had seen, in most of them it being much more marked. It was a kind of burnt smell.

Dr. DE VRIJ: I should certainly object to the introduction of oleic acid into pharmacy, for of all the fatty acids I know none which varies so much in its composition. Every one who has ever experimented with oleic acid knows that it rapidly absorbs oxygen from the air, and therefore it is very difficult to get it pure, so that

if you use oleic acid you will have to prepare it yourself. I certainly should not advise its introduction.

Mr. HANBURY: I think it is really very questionable whether the by-product of a German manufacturer, which can be had at a few shillings the cwt., is, after all, such a very admirable substitute for the old-fashioned olive oil which we have been accustomed to use. No doubt, it is right to take advantage of these chemical improvements, but we may perhaps, be in some danger of preferring cheapness to goodness.

Professor ATTFIELD: The oleic acid is very largely produced in England.

Professor REDWOOD: I may be allowed to express my thanks to the Professor for bringing this subject forward, and for having undertaken so many experiments in reference to it. You are probably aware that some time ago, and on more than one occasion, I have suggested to this Society the desirability of investigating the whole subject of the liniments used in pharmacy, for I consider those of the Pharmacopœia to be at the present time in a most unsatisfactory position. We are very much in want of some general principle upon which to proceed in the preparation of the liniments and in devising formulæ for them, and here we have a suggestion certainly which may prove useful, and though, as has been stated, the formulæ put forward are, perhaps, not yet perfect, further investigation may lead to very valuable results. I may mention, in particular, the liniment of turpentine with acetic acid—a preparation containing ingredients which separate immediately, and which cannot be kept united. I have made several experiments, with a view to getting a more homogeneous liniment as a substitute; in fact, the whole of them require revision, and I hope some day to see some general principle acted upon—some common menstruum adopted, which shall serve as a medium for the application of the more active constituents, and I look rather hopefully to the use of oleic acid.

Professor TICHBORNE: In connection with the objections which have been made, I will first of all make a remark in connection with linimentum potassii iodidi cum sapone, and the recommendation to make it of curd soap. We have been discussing the merits of the formulæ contained in the Pharmacopœia, and though this liniment is there mentioned, unfortunately curd soap is not. It has lately been introduced into the Addendum, but of course did not exist at the time the formula for that liniment was given, so that it was evidently intended that it should be made from a soap which was

an oleate of soda. While upon this subject I may dispose of the question of the purity of oleic acid, more particularly as one gentleman has objected to it as being indefinite, and thus unfit to be used as a substitute for soap. I must ask him did he ever go over a soap-works, and see the curious things that are sometimes put in the vats? Because, if he had, he would find that soaps are much more indefinite than commercial oleic acid. The sample on the table is a commercial sample, Messrs. Price's best quality; they have two, I believe. It is no pet specimen, it is just as any one would get it who ordered the best quality of oleic acid from that house. It is a very old sample, and was simply taken from a cask about half an hour before I left Dublin. It is no doubt true that, chemically speaking, a change takes place in oleic acid, and that it becomes chemically indefinite, and we have yet a great deal to learn on this subject. But it should be borne in mind I made a reservation, and said I was speaking of the properties of oleates as derived from commercial oleic acid. In connection with liniments, all we have to do with is the peculiar conditions they take as regards their consistence; and I think, on repeating my experiments, it will be found that, when made with oleic acid it is quite immaterial whether they are one month or twelve months old. Of course this is an important point, but after all it is a question of consistency. There are, I know some very inferior specimens of German manufacture in the market, but they are introduced for rough work, and no one would buy them for the purpose of making liniments any more than they would common soft soap made from fish oil. I do not think the smell is any practical objection. If you get oleic acid of inferior quality, no doubt it will have a strong smell, and you will find it varies in this respect very much; but I have no doubt, if there is any demand for it in pharmacy, that this little difficulty will be got over. I do not believe the smell has any connection with the oleic acid itself, as is shown by the fact that you find a different smell in different samples; but if you think for a moment that there is not one of these liniments on the table that does not contain a very strongly odoriferous substance, I think one might defy the most sensitive nose to detect the smell of oleic acid in any one of them.

Mr. WILLIAMS: I can well believe Professor Tichborne that the sample of oleic acid from Messrs. Price's he has shown us is an old one, for my experience is that you cannot get anything like it now. I have had a great deal to do with the preparation of oleate of mercury, and I find that oleic acid has become very bad of late, so

that there is great difficulty in preparing an oleate that will keep, and be what it ought to be as a pharmaceutical preparation. I have tried many experiments to purify this acid, but I have not yet succeeded to my satisfaction, and shall be glad if any chemist or pharmacist will turn his attention to the subject. I believe there is a great future for this article, and that it must come largely into use, but certainly the commercial samples now in the market are not good enough for pharmaceutical purposes.

A MODIFICATION OF LIEBIG'S VOLUMETRIC PROCESS FOR THE ESTIMATION OF PHOSPHORIC ACID.

By W. W. STODDART, F.C.S., ETC.

A short time ago, when examining some of the Somersetshire lias quarries, the author noticed the phosphoric appearance of some of the strata, but was too far away from laboratory assistance to prove the fact. In this emergency he applied to a country pharmacist, hoping to find some solution of iron that would enable him to roughly attempt the process devised by Liebig for estimating phosphoric acid. However, the only thing obtainable was the ordinary tincture. A trial, nevertheless, was made by means of that preparation, a little liquor ammoniæ and vinegar, with a small bit of ferrocyanide of potassium, and two long phials in lieu of a burette. The result, of course, only just enabled the author to choose for home examination those specimens that contained the largest percentage of phosphoric acid.

This little incident, after returning home, led to more extended experiments, which ended in the devising of what is believed to be an easy method, as well as a correct one, of determining the value of phosphates in manures and minerals.

This is often required by the agriculturist, geologist, and mineralogist, when both time and facility are of great moment. The magnesium method requires a considerable time for its completion, as well as delicate manipulation to avoid loss.

The uranium method, so well described by Mr. Sutton in his valuable work on volumetric analysis, requires so expensive and special a salt, that it is seldom found outside the well-appointed laboratory, where it is usually employed as extremely reliable and delicate.

It is to meet such cases as those mentioned that the method described in the following notes was devised:—

Long since it has been known that the solution of a soluble phosphate, mixed with an alkaline acetate and free acetic acid, is precipitated entirely by ferric chloride. Taking advantage of this reaction, Liebig suggested a volumetric process, and using ferrocyanide of potassium as an indicator. This is not so accurate a method as that with the uranium salt, and in practice is very troublesome, from the decomposition of the precipitated phosphate into a more basic condition, and also from the fact that the precipitate itself will produce a blue colour with the indicator.

The present modification is intended to obviate this difficulty by substituting the sulphocyanide of potassium for the ferrocyanide. The determination of the phosphoric acid is thereby rendered as easy and correct as that of the chlorides by nitrate of silver.

The following solutions are recommended:—

No. 1.

Perchloride of Iron	240 grains (or 24 grammes).
Water	10,000 grains (or 1 litre).

If not quite dissolved, add a few drops of hydrochloric acid. The liq. ferri perchlor., B.P., answers equally well.

No. 2.

Sodic Phosphate	504.2 grains (or 50.42 grammes).
Water	10,000 grains (or 1 litre).

One c.c. of this solution = .01 gramme or one ten-grain division of the burette = .1 grain of phosphoric anhydride. This solution is of course for the purpose of ascertaining the value of No. 1.

No. 3.

Sodic Acetate	2½ ounces (or 100 grammes).
Glacial Acetic Acid . .	2½ ounces (or 100 grammes).
Water	10,000 grains (or 1 litre).

The following is the mode of procedure in performing the analysis:—

Dissolve five grains of the sample in dilute hydrochloric acid, and to the filtered solution add about eight or ten drops of ammonia, and redissolve the precipitate with a little acetic acid. Then add one drachm of No. 3 and a few drops of the solution of sulphocyanide of potassium, and make up to about an ounce with distilled water. Now run in the No. 1, previously titrated, till the creamy colour begins to assume a reddish tint. The reaction is then complete, and the volume of iron used indicates the proportion of phosphoric acid precipitated. To find out very exactly the moment when sufficient iron has been employed, and begins to appear free in the liquid,

place on a white slab a filtered drop with one of the sulphocyanide, when the slightest reddish brown tint will show the time of saturation or when sufficient iron has been taken. It is always better to use a very dilute solution of the phosphate under examination, or the red tint will be hidden by the precipitate.

The sulphocyanide of potassium may be readily made by boiling together for ten minutes 120 grains each of common fused cyanide of potassium and sublimed sulphur in an ounce and a half of water.

The following comparative trials prove the constancy and accuracy of the sulphocyanide process, the result being calculated as tricalcic phosphate :—

	Magnesian process.	Uranium process.	Sulphocyanide process.
1. Superphosphate .	46·147	46·171	46·174
2. ditto . . .	39·165	39·169	39·168
3. Blood Manure .	32·459	32·462	32·465
4. Liassic Coprolite.	24·163	24·201	24·200
5. Guano . . .	26·440	26·452	26·454
6. Ditto . . .	32·314	32·320	32·326

The PRESIDENT said the use of sulphocyanide as an indicator in place of ferrocyanide seemed a manifest improvement in the process.

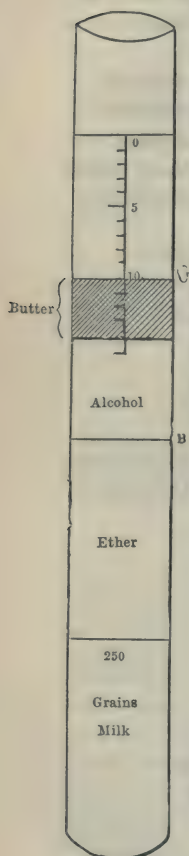
NOTES ON A NEW LACTOMETER.

By W. W. STODDART, F.C.S., ETC.

At the present time, milk analysis is engaging the attention of many chemists, and eliciting the most discordant opinions. This may probably arise from local reasons, or difference in food or weather, or else what is more likely still, from the apparatus employed in the research. Many analysts have, and still do make use of the old-fashioned graduated lactometer, the indications of which are worthless and deceptive in most cases.

I am anxious now to bring before your notice a most ingenious piece of apparatus, invented by Mr. Horsley, of Cheltenham, and which, I think, will turn out extremely useful. It shows the fat or cream distinctly and perfectly separated. By it you can calculate the weight per cent., and estimate the casein and the sugar and salts with great ease and rapidity. Indeed, the whole operation only takes ten minutes, or a quarter of an hour, and the results may be kept for observation for any length of time, an advantage of no mean importance when legal consequences are dependent on the analytical evidence.

The method of analysis is this. The milk to be tested is poured into the tube (*vide* woodcut) till the first mark is reached, measuring off 250 grains. Methylated ether is then added until the next mark, B, is reached, and the whole well shaken together for five minutes. Methylated spirit is next poured in up to 10 of the graduations, C, and again shaken for five minutes. On placing the tube in the stand, the fat will rise to the top as a bright yellow oil, the measure of which will indicate the *weight*, because each graduation is equal to 4.15 grains of fat. The casein separates, and falls to the bottom of the tube as a white mass, capable of being strained off, dried, and weighed. The remaining fluid, after evaporation to dryness, will give the amount of sugar and salts. As an example, the milk in No. 1 tube is a rich sample from an Alderney cow, and it will be seen that the fat from 250 grains of the milk occupies four of the graduations on the tube.



Therefore—

$$\frac{4 \times 4 \times 4.15}{10} = . . 6.64 \text{ fat.}$$

Then the sediment = 10.8 grains, so that

$$\frac{10.8 \times 4}{10} = . . 4.32 \text{ casein.}$$

Residue after evaporation = $\frac{14.2 \times 4}{10} = . . 5.68 \text{ salts and sugar.}$

Total solid contents = 16.64 per cent.

The other tubes would equally show the same thing ; for instance—

No. 2 tube shows 3 graduations $\frac{3 \times 4 \times 4.15}{10} = 4.98 \text{ p.c.}$

It has had 25 per cent. of water added.

No. 3 shows 1 graduation . $\frac{1 \times 4 \times 4.15}{10} = 1.66 \text{ p.c.}$

It has had 50 per cent. of water added, and had 25 per cent. of fat removed.

No. 4 shows 2 graduations = $\frac{2 \times 4 \times 4.15}{10} = 3.32 \text{ p.c.}$

This has had 50 per cent. of water added.

No. 5 contains milk made from the Aylesbury condensed milk by adding 4 pints of water.

$$\text{The tube shows 1.5 graduations} = \frac{1.5 \times 4 \times 4.15}{10} = 2.49 \text{ p.c.}$$

No. 6 contains milk made in the same way from the Anglo-Swiss Company.

$$\text{The tube shows 1 graduation} = \frac{1 \times 4 \times 4.15}{10} = 1.66 \text{ p.c.}$$

The tube, if wished, can also be used as an ordinary lactometer, for every degree is $\frac{1}{100}$ of the whole. Another purpose for which I have used Mr. Horsley's tube, is for the analysis of butter, and to show whether or no it is adulterated or lowered with any other fat, etc. A weighed portion of butter is placed in the tube, and dissolved in ether; when dissolved as much as possible, water is added to mark B, and well shaken. Methylated spirit is then poured in till mark C is reached, and then well shaken for a minute or two and laid aside to settle. The butter is then measured off and calculated as before. The following example will explain:—Fifty grains of pure fresh butter were placed in the tube, and ether poured in to A. By a little agitation, the butter soon dissolved, and water being added to B, the whole solution well shaken. Methylated spirit was poured in *to the top* of the graduation, and after shaking for one or two minutes, laid aside to settle. In this case, $11\frac{3}{4}$ degrees were obtained, therefore, the sample consisted of $97\frac{1}{2}$ per cent. of pure butter, for

$$11.75 \times 2 \times 4.15 = 97.52$$

Any adulterating fat will be seen on a layer at the bottom of the bright yellow butter oil. The curd, on the contrary, will fall slowly to the bottom of the tube.

A vote of thanks to Mr. Stoddart having been passed,

Professor REDWOOD said: I should like to ask Mr. Stoddart one question, a satisfactory answer to which would be very valuable to myself and others. I wish to know how he distinguishes between the fat which he says is an adulterant of butter, and the butter itself; what kind of chemical distinction does he draw between butter and ordinary animal fat which would have a similar melting-point? I confess I am not acquainted with any real distinction between the various fats consisting of stearin, palmitin, or olein. If this mode of proceeding does afford a reliable method of distinguishing between butter fat and such a substance as yellow beef fat,

which I believe is often added to butter, it would be a most valuable process, for at the present time this is a great difficulty with all analysts.

Mr. STODDART: I would just say, in reply to Professor Redwood, that if he will get an ounce bottle, and put into it 50 grains of butter, half fill with ether, and give it a good shake, if it be good butter it will all dissolve, except the salts and the water. To get rid of that I usually mix the butter with boiling water, so as to free it from salts and soluble matter. If the butter be genuine, it will, when treated as I have stated, all dissolve; but if lard or meat fat be added it will not dissolve, on stirring for two or three minutes it will go to the bottom. Some people would say, without further consideration, that what sank to the bottom was fat, but it may be curd, for what country people call whey-butter has frequently 8 or 9 per cent. of curd in it. You have, therefore, to distinguish whether it is fat or curd. A very simple way of determining it is to put a small portion on a glass slip, and heat it; if it is fat it will, of course, melt, and if it is curd it will dry and go to powder.

Mr. RIMMINGTON inquired where these tubes could be obtained.

Mr. STODDART: They may be had of Mr. Balcomb, chemist, Cheltenham.

(For the continued discussion on this subject, see page 580.)

Friday, August 7th.

The Conference reassembled at ten o'clock.

The proceedings commenced by Professor Attfield, the general Secretary, reading the list of names of gentlemen who had been proposed as members, and who were unanimously elected.

The following paper was read by Mr. H. C. Baildon on—
BRIEF NOTES ON THE BARK OF THE BLACK ALDER
TREE (CORTEX RHAMNI FRANGULÆ).

By H. C. BAILDON.

I think I may assume that most of the members of the Conference that are present have read Mr. Ince's contribution regarding this bark, which appeared in the *Chemist and Druggist* of June last. This paper, and my remarks in the *Pharmaceutical Journal* of the 9th of May, have already brought it into considerable use, and I feel confident that it will be found to be a very valuable addition to

the rather limited list which we possess of vegetable aperients. In making these brief remarks, I am more anxious to elicit the opinions of those members who have experimented upon it, than to add to what I have already communicated. To prevent disappointment, it is very desirable that the bark used corresponds to the description of it given in the German Pharmacopœia, viz., "the cortex of the younger trunks and the larger branches of the indigenous shrub gathered in the spring." The sample now shown is taken from a bale recently received from Antwerp, and corresponds with this description. The concentrated decoction prepared either *in vacuo* or by Mr. Giles' process of exhausting successive quantities of the bark, will, I think, be found the most eligible form for its administration, and this is now ordered in prescriptions by some of the leading practitioners in Edinburgh. In addition to the concentrated decoction, I have prepared a strong tincture by distilling off a greater part of the rectified spirit, a drachm of which represents an equal quantity of the bark. From its small bulk, it may occasionally be found a convenient preparation.

Mr. Baildon went on to say :—A sample of extract is also on the table, and it is probable that in the form of pills it may be advantageously used. I know Mr. Giles has experimented a good deal upon this bark, and I should be glad to hear the conclusions he has arrived at as to its value in pharmacy. Both Mr. Ince and Mr. Umney have also paid considerable attention to this drug. I am also glad to observe Dr. de Vrij present, as he will be able to state the estimation in which it is held in Holland and on the Continent.

A vote of thanks was passed to Mr. Baildon.

Mr. INCE : Mr. Baildon has made an allusion to a paper which he has kindly described as my own on the cortex rhamni frangulæ. I was very happy to be able to take his facts and experiments, and arrange them into a connected and intelligible form, but I cannot claim the slightest originality for the remarks I then made. I am bound, however, to say that I approached the subject entirely from a personal motive, because the greater part of my occupation being sedentary, it has induced a constant constipation which is extremely hurtful in its effects. Now, though I am strongly opposed to anything in the shape of testimonials at meetings of this kind, I think we must distinguish between testimonials and testimony, and that I am entitled to bring forward the results of my own experience with regard to the use of this drug. I first became acquainted with it

by reading an old paper by Mr. Baildon, read, I think, at Edinburgh, but which, being short, did not at the time receive much attention. He there described the manner in which this drug was used in Holland, where I found the people were in the habit of taking a small quantity of the bark, say half a ounce, putting it into a pint of water, and evaporating down to one-half, which was then taken in the ordinary doses of a decoction, *i.e.*, about one ounce and a half at a time. I thought it would be well to try the effect of this very simple remedy, and the result was truly marvellous, though I am afraid of using exaggerated terms. It answered in every possible respect the purpose intended. Now, it is well known that it is of no use attempting to introduce a mere plain decoction into general medical practice, because it will never be faithfully executed; persons accustomed in ordinary domestic life to make preparations of this kind very successfully, seem to lose their presence of mind when the same thing comes under what may be called the scientific aspect, and, in practice, decoctions are very seldom well prepared. I was therefore rejoiced to find that a good preparation of the cortex was to be introduced, as it has now been, by Mr. Baildon. The method is simply to exhaust the bark by cold water, exactly in the way originally proposed by Mr. Giles, and then concentrate into a liquor, not into an essence, which I consider very objectionable, as being much too concentrated. This method seems to me to leave nothing to be desired; the whole of the active principle of the bark seems to be got out, and it is then evaporated to a proper consistency *in vacuo*. This makes a very attractive-looking liquor, and I can answer personally for its efficacy. It is very difficult to get an aperient which is not accompanied by distressing effects; senna, for instance, is often followed by very bad results, and it is also uncertain and distasteful. Now, the cortex rhamni has certainly the advantage of an agreeable taste, it produces no bad after-effects, and, as far as my experience goes, is an exceedingly satisfactory and efficient preparation. I think, therefore, it is quite deserving of a more definite notice than has yet been accorded to it, and might well be added to any future Pharmacopœia.

Mr. GILES: I am quite prepared to fully endorse everything which has been said in praise of this article by Mr. Baildon and Mr. Ince. Mr. Baildon has, I think, reintroduced a most valuable agent into our materia medica, and I am disposed to say not only a better aperient than any other, but the only aperient that we have. We have many cathartics, but not aperients. Perhaps this may seem an artificial distinction, but the especial

character of the *Rhamnus* is that it appears to be an invigorating stimulus to the bowels, and not an irritant. Irritants are followed by a sort of collapse, the over-stimulation is followed by a reaction, and very often, as we know, by greater constipation than preceded their use. Now, the *Rhamnus* has the exactly opposite character; it appears to regulate the conditions of the functions of the body, and I do not think this is limited to the action of the bowels. People may take it, and after it has produced its effect, instead of requiring to take more, they become more and more independent of it. It is a remarkable fact, as has been pointed out by Mr. Baruchson of Liverpool, that the same doses, or rather less doses than the original one, continue to be operative. I have met with cases where it has been said to fail, but I believe that is because people do not distinguish between this regulative aperient action and a cathartic action. They want some *ad captandum* explosive purgative, and are disappointed if they do not meet with it in *Rhamnus frangula* bark. But I think they are looking for that which is just undesirable, and to what we have been driven to use for want of something better, but which I think will be superseded by a larger experience of the *Rhamnus frangula*. One does not go far into therapeutics at a meeting of this kind, especially if they touch on delicate functions; but I must say I have reason to believe that the action of this article in restoring the regularity of the alvine action in females, also leads to greater regularity in other constitutional functions, and that of course is a matter of very high importance. I cannot say that I have yet sufficient general experience in that direction, but I am strongly induced to believe that it is so, and I propose to carefully watch its action in this respect. So far as to its general therapeutical effects. As to its preparation, obviously, as Mr. Ince says, we require something which shall be more permanent than a decoction, although it is a remarkable fact that the decoction, in virtue apparently of some prussic acid constituent, is very permanent, and my opinion is it would keep, even in the summer, for a month. Still we want something perpetually permanent, and that is easily obtained in the form of a liquor, such as Mr. Baidon and myself agree in approving. The reduction of things *in vacuo* is unquestionably the best form of reduction, but there is no necessity for any reduction at all in this case, because it is perfectly easy to prepare the liquor in its due strength by the first process, and that is the course I adopt, not by a cold-water infusion, but by simply stewing for a quarter of an hour consecutive portions, by which means I easily

get a result three times as strong as the decoction which Mr. Baildon introduced, and it has simply to be preserved by the addition of a sufficient quantity of spirit. You then have a liquor which has been subject to no process of evaporation, or any further action of heat than in the ordinary decoction, which is quite permanent. I have watched the action of the two, and there is no appreciable difference in their value. I think Mr. Baildon has been the means of introducing to medical practice in this country a most valuable remedy, and I have not the smallest doubt the more it is investigated the more it will be approved, and that it must ultimately find a place in our official *materia medica*.

DR. DE VRIJ: I can only confirm what has been said by all three gentlemen who have spoken about this medicine, which is very much used in Holland. A brother of mine, who was a physician, used it for many years without any bad effect whatever, and, contrary to the majority of other purgatives, he did not become accustomed to it; in fact, the same dose always had the same effect. He used the decoction, but I quite agree that this preparation is much better, because you can keep it longer, and always have it at hand.

MR. SIEBOLD: It has long been a matter of surprise to me that this article has not found its way into the British Pharmacopœia, because for the last twenty-one years I have known it to be used uninterruptedly in Germany, where it has been universally liked as a very pleasant purgative—pleasant not only in taste, but also with reference to its effects. Considering the intimate intercourse which now exists between the different European countries, it seems astonishing that a medicine can be very much appreciated for many years in one country, and yet hardly be noticed in another so close to it. I think that meetings such as the present will tend to rectify this evil, and that, in course of time, those medicines which are proved to be of great value, will not simply be the property of one country, but of all the world.

PROFESSOR BENTLEY: I have been very glad to hear the repeated observations to-day as to the merits of a substance which has been certainly known in this country for more than twenty-five years. As long as I can recollect anything connected with scientific subjects, I remember Dr. Pereira mentioned to me, when I was a colleague of his at the London Hospital, this very bark, of which he gave me a specimen, not knowing exactly what it was. I had then an opportunity of examining the plant from whence it was derived, and determining its botanical source. I know that at

that time it was in use in Germany, as Mr. Siebold has said, and from that period to this it has always been esteemed as a medicine of considerable value. It is certainly a remarkable fact, that such a substance should not have received more attention in this country, and I am very glad to hear the testimony now given as to its efficacy. I should like, however, to have heard whether, as Mr. Baildon has brought it before the notice of the profession for some time, and as Mr. Giles has investigated its properties very carefully, it has been tried at the Bristol Infirmary, or if any results have been obtained by physicians; because it is very important not only to have the testimony of pharmacutists to its value, but, if it is to be strongly recommended, that this should be supplemented by the acknowledged experience of those whose special duty it is to take notice of these remedies. This subject raises a question which I have more than once alluded to in this room, as to the desirability or necessity of having some list of medicines which are of considerable reputation, or which are known to have some repute on the Continent, or in America, or elsewhere, added to our Pharmacopœia as a secondary list.

The PRESIDENT: I quite agree with what has been said as to the desirability of introducing an aperient of the character ascribed to the cortex rhamni frangulæ, and I think we are greatly indebted to Mr. Baildon for bringing it forward. When he first introduced it at Edinburgh, I obtained a few samples from him, made a decoction, which I preserved with glycerin, and tried it on myself. But I must say that I cannot endorse all that has fallen from Mr. Ince and Mr. Giles with respect to it, for I did not find any definite action beyond that of other purgatives, still, I shall be inclined, after what has been said, to try it again.

PRESENCE OF LEAD IN LIQUOR AMMONIÆ ACETATIS.

BY LOUIS SIEBOLD.

Some time ago, I was asked to certify the total absence of lead in a sample of water used for the manufacture of soda water. 500 c.c. of this water, acidulated with pure HCl and treated with H₂S, remained clear and colourless.

In order to detect the smallest trace of lead, if present, a somewhat larger quantity of the water was slightly acidified with acetic acid, mixed with two fluid drachms of strong solution of ammonium acetate (to prevent any precipitation of sulphate of lead), evaporated to the bulk of two fluid drachms, filtered, and treated with

H₂S. A very distinct black precipitate was obtained, which, upon examination, proved to be sulphide of lead. The striking reaction obtained contrasted so strangely with the entirely negative result of the first experiment that I felt convinced the quantity of lead found did not emanate from the water, and upon now testing two fluid drachms of the same solution of ammonium acetate with H₂S, I obtained as distinct a precipitate of Pb S as in the previous experiment. I then prepared some fresh solution of ammonium acetate from pure acetic acid and pure solution of ammonia, and using two drachms of this in precisely the same way as before, the water under examination was found to be absolutely free from lead. I preserved the remainder of the solution of pure acetate of ammonium in a white glass stoppered bottle, and marked the date when it was made and tested on the label. About a month afterwards, I used some of this solution for the same purpose as before, and was much surprised to find it contaminated with lead, which it had evidently dissolved from the glass bottle in which it had been kept. This circumstance induced me to procure, from different retail establishments, samples of liquor ammoniæ acetatis concentratus (as generally sold by wholesale houses), which is eight times as strong as the B.P. article. Out of ten samples examined only two were free from lead. My own stock was found to be thus contaminated, though it was certainly free from that metal when it was made. I have also examined four samples of liquor ammoniæ acetatis of the B.P. strength, but could only find very small traces of lead in one of them.

The solvent action of ammonium acetate upon sulphate of lead and other insoluble lead compounds is well known, but its power of dissolving lead from glass has, I believe, not been previously observed. Fresenius, in describing the extraction of lead from substances insoluble in water and acids by means of ammonium acetate, states in a foot-note, that this method is not applicable for the detection of lead in silicates. Yet the above experiments show that by the long-continued action of liquor ammoniæ acetatis upon glass containing lead, an appreciable quantity of the latter is dissolved, and as this is undoubtedly a most objectionable impurity, I would suggest that this liquor, and especially the concentrated preparation, be kept in bottles free from that metal.

The PRESIDENT: Mr. Siebold's investigations show a very possible source of error in the analysis of potable water. The action of

acetate of ammonium as a solvent of some of the soluble lead salts was pointed out some twelve months ago in the case of iodide of lead. An instance of that occurred to me the other day. I expected to get a precipitation of iodide of lead, but found that I got none until I added some nitric acid. I could not make out the reason of that for some time, but at last I found that I had acetate of ammonium in the liquid, so that the iodide of lead was kept in solution. I beg to propose a vote of thanks to Mr. Siebold for his paper.

The vote of thanks passed unanimously.

THE ADULTERATION OF SCAMMONY.

Mr. BENDER then read a paper by Mr. Greenish on "The Adulteration of Scammony."

The result of a microscopic examination of different samples of virgin scammony may at the present time possess some interest, and if it gives rise to a discussion, some remarks may be elicited possessing more intrinsic value than the paper itself.

I was induced to undertake this subject from having observed that the presence of starch was usually detected by iodine, and that little attention had been given to determine the particular kind of starch granules, whether of wheat, or those peculiar to the scammony root itself.

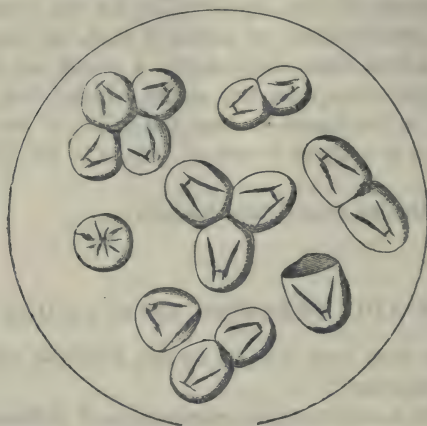
The scammony which appears in English commerce is principally of four kinds—virgin scammony, Angora scammony, Syrian scammony, and Skeleep scammony.

Of the virgin scammony not more than 800 lbs. arrives in this country yearly, none of which is again exported. Of the Angora and Syrian scammonies about half a ton each are annually imported. Of this quantity half remains in this country. Of the Skeleep scammony about one ton annually arrives in London, only half of which is again exported.

The Angora and Syrian scammonies vary in amount of resin from 46 to 76 per cent., while the Skeleep contains about 36 per cent. only, the remainder being impurity.

We have thus one ton of adulterated scammony remaining in this country every year. According to Mr. Maltass, the peasants adulterate scammony before bringing it into the market, the adulterations being wheat starch, wood ashes, earth, gum arabic or tragacanth, pounded scammony roots, etc.

The starch granules peculiar to the scammony root are shown in this diagram; they are, for the most part, compound, composed of



two, three, and sometimes more granules. In shape the single granules resemble those of *Tacca*, muller-shaped, with dihedral base, and the hilum approximates to that seen in the starch of orris-root. With polarized light the arms of the black cross run down in the direction of those lines marked on the grains. Occasionally a lenticular grain is met with, but the hilum or markings about the hilum serve to distinguish it from that of wheat starch, to which it otherwise bears a close resemblance.

The starch grains from the scammony root vary very much in size about the centre of the root, where the texture is loose; some granules will be found very large; at the same time, in company with these, will be found a good many of very variable size.

From an examination of a variety of samples of virgin scammony from different sources, I may state as a result, that the *lump* was in every instance free from the starch of scammony root or any other starch, and that every sample of *powdered* virgin scammony contained more or less of the scammony starch, and some of them a little wheat starch in addition. A few also contained particles of the tissue peculiar to the root with the starch grains still in it, and I would observe that the examinations here referred to were made on the finest samples of virgin scammony.

In these investigations I think it very desirable, having determined the presence of starch, to distinguish the granules of the scammony starch from those of wheat. I consider that the pre-

sence of the scammony starch indicates an admixture of inferior scammony, and more especially when it is accompanied by some of the tissue of the root. There exists a theory to account for the wheat starch, that it is used to prevent the semi-solid gum resin from sticking to the hands. If this were correct, I should expect to find it *especially* in that powder which adheres to the outside of the lumps of scammony, constituting what may be termed the bloom upon it; but I do not find this to be the case in the samples which I have examined, neither does the greyish white powder which covers the lump consist, so far as I have observed, of chalk. It seems to me to be merely the particles of scammony reduced to a powder by the friction of the lumps against each other, and it is of the same quality in every respect as the lump from which it has been detached.

I can only account for the presence of starch in powdered virgin scammony, by reference to the practice of picking the virgin scammony in lump from the chest, and suggesting that after a good deal of picking there must remain a quantity of fragments, too small for further picking, but not for grinding. To this must be added the fact, that sometimes in a chest a good piece of virgin scammony may have a very inferior one stuck to it, so as to escape observation. It is much to be desired that flour and starch, when spoken of in connection with scammony, should not be considered synonymous. I have never met with cellular tissue, such as I should expect to find if flour had been present.

It is an interesting question, whether the gum resin possesses any value over the more uniform and less costly resin obtained from the dry root. If it should prove that the resin is equally active and more reliable than the exuded gum resin, then the pharmacist would be independent of the Greek of the Levant, or the Turk nearer home.

I have examined the mineral matter scraped from the outside of a fine specimen of the root, and find it to be, as already shown by Professor Attfield, a calcareous earth, which effervesces with hydrochloric acid, indicating that it was grown on a chalky soil.

A vote of thanks was passed to Mr. Greenish for the paper.

Mr. HANBURY: One point in the paper interests me much, and that is Mr. Greenish's observations about the powder which is found on the outside of the pieces of scammony. I was lately much surprised to hear the presence of starch in scammony accounted for

by the notion that it was used to prevent adhesion of the lumps. Mr. Greenish says that he does not find any starch on the exterior of the pieces nor any calcareous matter. I cannot speak as to starch, but I long ago noticed that the powder that occurs on the outside of a piece of scammony does not effervesce, and therefore is not identical in nature with the calcareous matter used to adulterate the drug. There appears, in fact, no ground for supposing that the pieces are rolled in any powder in order to prevent adhesion. I regret that Mr. Greenish has not sent the specimens he alludes to, because I should like to know what are the drugs he terms Angora and Syrian scammony. I am not aware of any such distinctions existing in the London trade.

Mr. GILES: I should just like to refer to the introduction in our Pharmacopœia of the resin of scammony, and the retention of the virgin scammony, one being used for some preparations and the other for others. I believe this has been discussed before, but it appears to me there ought to be some conclusion arrived at as to which is the best, and that that should be adopted. I do not see the advantage of using virgin scammony for the pill, and resin of scammony for the extract.

The PRESIDENT: Have you not the option.

Mr. GILES: No.

Professor REDWOOD: I do not know whether Mr. Giles has sufficiently taken account of one circumstance, which certainly did come under the notice of the Pharmacopœia Committee, and that was that it had not been quite clearly decided which is the best of the two, or whether there is any difference between them. Some advocate the use of resin of scammony, and others consider the virgin scammony more active and reliable, and it was thought, as there were two preparations similar in their effect, that at least we might give an option to medical men to select which preparation they would prescribe. I think that was the motive which led to the introduction of the new form of resin of scammony in the one case, and its not being adopted in the other.

The following papers on hydrocyanic acid were then read:—

NOTE ON THE DILUTED HYDROCYANIC ACID OF PHARMACY.

By MR. BARNARD S. PROCTOR.

The variability of pharmaceutical hydrocyanic acid has long been felt to be of serious moment, and has recently become a matter of

great notoriety, attention having been called to the extent of the variations by analysts in sundry neighbourhoods. In June, 1873, Mr. Abraham, of Liverpool, gave the results of four examinations as 2.11 per cent., 2.02 per cent., 1.64 per cent., and 1.30 per cent.

At the Pharmaceutical Conference at Bradford, Mr. Siebold stated that he found it vary from about 2.00 per cent. to 0.25, or even less, and he attributed the variation to evaporation from imperfect stoppering of the bottles.

Dec. 27, 1873.—Mr. Towerzey having titrated nine samples, gave his results as 1.93, 1.52, 1.36, 1.32, 1.26, 1.22, 1.16, and 0.26 per cent. Other analysts, at different dates and places, gave similar testimony.

That such a condition should continue to exist is highly unsatisfactory—we may even say a disgrace to pharmaceutical chemistry. Many remedies have been proposed, and I now purpose to bring before pharmacists the unripe fruit of my small labour in this field.

Two objects seem desirable of attainment—first, the discovery of some simple, cheap, rapid, and accurate process for preparing small quantities of hydrocyanic acid of the official strength, by which every pharmacist could prepare his week's or month's supply, and throw away his old stock without any unreasonable expenditure of time and money; the second object being the production of an acid of official strength, which, by some simple addition or alteration, would be less liable to variation in strength by keeping.

It is unnecessary for me to recount in detail what has been done in these respects, but I may just mention that two processes for extemporizing the solution, one from the decomposition of cyanide of silver with dilute hydrochloric acid, leaves nothing to be desired but economy; and the other, in which cyanide of potassium is decomposed by solution of tartaric acid, depends upon a salt liable to deliquescence and decomposition, and the product is contaminated with a trace of organic acid, which, it has been said, though I do not know upon what evidence, has the reverse of a conservative action.

The official acid is liable to loss of strength from at least two causes—evaporation, and the formation of paracyanogen, probably also some other decomposition not indicated by a visible change in appearance. The customary precautions against these sources of loss are, careful stoppering and inversion of the bottles to retard evaporation; the exclusion of light, and the addition of sulphuric or hydrochloric acids to protect it from decomposition.

My first experiments were with the view of finding some solvent which, from a greater affinity for the acid, or from a volatility more equal to that of the acid, would diminish the variation dependent upon evaporation.

Alcohol and ether naturally suggested themselves, and in November last I made three specimens of the acid to test the relative merits of these solvents.* The first solution, prepared with water for comparison, and marked A; the second being rectified spirit, and marked B; the third, C, being ether. These acids, when prepared were decanted into three well-stoppered bottles of the same size, and having necks of precisely the same width (the stopper of any one fitting the other two).

The acids were decanted from the precipitates on the 12th of November, and at once tested volumetrically with nitrate of silver.

A contained 1.86 per cent. of H Cy.

B	„	1.86	„
C	„	1.92	„

In these, and the subsequent determinations, I place little reliance on the second decimal figure. My object is to ascertain what can be conveniently done as an ordinary pharmaceutical process. I therefore operated with ordinary pharmaceutical weights and measures. The error in measuring thus may readily amount to two or three units in the decimals, but this is of little moment, as the variations in actual practice are so large as not only to affect the fractions, but the integers. But to return to the experiment.

The phials containing these specimens were placed in my office, stoppers uppermost, not exposed to a strong light, and the stoppers were removed, half a minute to two or three minutes at a time, several times a day for a week; this being supposed to represent, in a rather exaggerated form, the kind of exposure which it is desirable a pharmaceutical acid should stand in actual practice. To ensure that the specimens were equally treated, the stoppers were always taken out and replaced in rotation, the stopper being taken out of A and laid beside the bottle, while the same was done for B and C, and then, after a short interval, replaced again in the same order.

* The general formula being—Cyanide of silver 40 grains, diffused through 7 fluid drachms of the solvent, and 36 minims of hydrochloric acid added, the mixture well shaken and allowed to subside. The solution decanted after a week (though probably an hour might have sufficed).

On the 19th of November (*i.e.*, at the interval of a week), they were again subjected to analysis, with the following results:—

$A = 1.76$ per cent.

$$B = 1.80$$
$$C = 1.84$$

The loss in all cases was very much smaller than I anticipated, though the comparative losses were in the order which theory had suggested.

The specimens were then exposed to a more severe test, by the stoppers being removed from the bottles for periods varying from half an hour to three hours daily for eighteen days; at that date (Dec. 6, 1873) they were again analyzed, with the following results:—

$A = 0.84$ per cent.

$$B = 1.16$$
$$C = 1.84 \quad , \quad *$$

These results very much astonished me.

Bearing in mind the numerous statements of rapid loss by evaporation, it seemed scarcely credible that the aqueous solution should retain nearly half its original strength after such exposure. Take for comparison the statement of Mr. L. Siebold, whose accuracy I cannot question. In illustration of the rapid loss by evaporation, he says:—"I purchased a two-ounce bottle of the Pharmacopœia acid, freshly made, from a very respectable wholesale house, and at once estimated its strength by volumetric analysis. It contained 1.6 instead of 2 per cent. It was kept in the same bottle without being tied over, and the escape between stopper and neck was noticeable at some distance. After twenty-four hours it contained 1.2, after two days hardly 1 per cent., and after a month it contained only traces of H Cy ."

The strength of the ethereal solution was also unexpected; for, though the ether had evaporated much, we could not have predicted that it would have passed off in as great a proportion as the H Cy , since, of the two liquids in their anhydrous state, H Cy is the more volatile; but, on the other hand, it is quite supposable that a com-

* These having been kept till Jan. 31, 1874, without any special precautions, but occasional opening, yielded :—

[illegible]

pound of the two may be formed, less volatile than either separately.

With the view of estimating the comparative affinity of water and ether for the acid, I took equal volumes of ether and a specimen of commercial hydrocyanic acid which contained 1.90 per cent. of H Cy; after agitation and subsidence, the ethereal solution contained 1.48 per cent. of H Cy, and the aqueous only 0.5 per cent. This total is apparently more than the aqueous acid contained, but the discrepancy is accounted for by the ethereal solution being smaller in bulk—a portion of the ether having been dissolved by the water.

From this result it would appear that the ether has about three times the affinity for the acid which is possessed by water.

I have made no attempt to estimate the affinity of alcohol for the acid, and a considerable time must elapse before we can determine the relative keeping qualities of acids in which the menstrua are mixtures of alcohol and ether.

For the present I have left this part of the subject, to try a few experiments upon processes for the extempore preparation of the acid in combination with any of the solvents.

The problem is to find a base which forms a definite cyanide not liable to spontaneous change under ordinary keeping, but readily and completely yielding its acid, the base being completely precipitated by one of the common acids, from a solution in one of the three solvents already spoken of.

Cyanide of potassium, as met with in commerce, is very impure, and liable to decomposition, but that which has been crystallized from spirit is probably sufficiently uniform and stable to be used with satisfaction if a better salt be not found. A specimen which I have had for eight years, *not* very carefully corked up, contains 80 per cent. of its theoretical cyanogen, 7 per cent. of water, part of which was probably present when new, and so much carbonic acid as to effervesce on the addition of tartaric acid to a strong solution, though not to do so visibly, when the strength of the solution is calculated to yield hydrocyanic acid of 2 per cent.*

Fifty grains of this salt, with 980 grain measures of rectified spirit, and decomposed with a little more than an equivalent of sulphuric acid, gave a bulky precipitate of potassium sulphate, which, after a few days, contracted, and became contaminated with

* A new sample of crystallized cyanide of potassium I find contains 94 per cent. of the theoretical cyanogen—a little carbonic acid and moisture.

a brown matter, perhaps paracyanogen. These proportions were calculated to give an acid of 2 per cent., had the cyanide been perfect, or an acid of 1.6 per cent. with the sample of salt used : it was found, however, to contain only 0.68 per cent., and a similar specimen prepared in the same way, except that the spirit was mixed with $\frac{1}{8}$ of ether, presented similar appearances, and gave 0.74 per cent. of H Cy. Fifty grains of the same cyanide dissolved in 980 grain-measures of water, and decomposed with an excess of tartaric acid, speedily deposited its cream of tartar, and yielded a solution containing 1.56 per cent. of H Cy—1.60 per cent. being the strength it was calculated to be.

A similar mixture made with rectified spirit in which neither the salt nor the tartaric acid is so freely soluble, was titrated after standing an hour, and only indicated 0.28 per cent. of H Cy. After a lapse of three hours the titration was repeated with the same results. After two days a pale brown granular deposit had taken the place of the lower part of the precipitate, and the percentage of H Cy had increased to 0.36.

A third modification of this formula was made by dissolving the acid and cyanide in separate portions of water, mixing the solutions, and after the lapse of an hour adding an equal bulk of rectified spirit, the general proportion between solvent and solids being maintained. This solution contained 1.64 per cent. H Cy.

A fourth modification consists of cyanide of zinc and potassium precipitated by tartaric acid ; this has an advantage over the other in the greater stability of the salt, which does not absorb water or carbonic acid, nor part with cyanogen by ordinary keeping. It has the disadvantage of yielding a more bulky precipitate.

The details of the experiment were as follows :—

Two grams of cyanide of zinc and potassium dissolved in 42.8 grams of water (Towerzey's form as a substitute for B.P. acid) when titrated gave results equal to 1.92 per cent. H Cy. Four grams of tartaric acid being added to the solution yielded a bulky precipitate which, after standing three hours, occupied one-third the bulk of the liquid. The clear liquid again examined was found equal to 1.88 per cent H Cy. The phial being set aside from the time it was made, about the middle of February, till the middle of July, the sediment had diminished to about $\frac{1}{3}$ the bulk of the liquid, and though only stopped with a common cork, the strength of the acid was still 1.86 per cent. The apparent loss of strength consequent upon the addition of the tartaric acid is no doubt due to the increase in bulk due to this addition.

The solution of course contained a little acid tartrate of potassium and only a trace of zinc.

It has been suggested to introduce this double cyanide of zinc and potassium as a substitute for hydrocyanic acid for medicinal purposes, it being supposed, on theoretical grounds, that it would have similar therapeutic value, together with constancy and permanence; but, however much may be expected from it in these respects, it cannot, for a considerable period at least, displace the acid which, with all its faults, has had a good reputation for several generations.

A fifth modification consists of cyanide of potassium and tartaric acid, dissolved in small portions of water, mixed, and, after a few minutes, adding spirit and ether, the proportion of solvents to solids being still the same, but the solvent consisting ultimately of equal parts of water, spirit, and ether.

This being made with the new sample of cyanide, should have yielded an acid of 1.88 per cent. but it was found to be 1.78.

The cyanides of lead, calcium, and barium to be decomposed by sulphuric acid appeared next in order of prospective merit, but cyanide of lead is said to be an uncertain compound, containing variable proportions of oxide.

I am also informed by Messrs. Hopkin & Williams, that "the cyanides of calcium and barium, prepared from the ferrocyanides, are worthless, and when prepared in solution by neutralizing baryta or lime water with hydrocyanic acid, decomposition sets in at once, and in the course of an hour or so black solutions result, quite free from cyanogen in any shape."

I have consequently limited my experiments to the materials already mentioned.

Of fifteen specimens made by different formulæ and kept for five months, one only has turned brown; it contains cyanide of potassium, water, sulphuric acid, and spirit, and gives an alkaline reaction with red litmus, though it has a strong odour of HCy , and contains 1.58 per cent. now, against 1.64 while new. Two other specimens turned slightly yellow; they were prepared from cyanide of potassium, with sulphuric acid and spirit, and, as before mentioned, had deposited a brown sediment along with the potassium sulphate.

Comparing the different specimens containing water only with those containing water and spirit, I do not note any very clear advantage in the keeping quality of the alcoholic, except in the first series, previously named A, B, C. The following table gives the

dates at which these samples were examined, and their value in percentages of the B.P. standard:—

	A.	B.	C.
November 12, 1873 . . .	93	93	96
„ 19, „ . . .	88	90	92
December 6, „ . . .	42	58	92
January 31, 1874 . . .	24	38	90
July 17, 1874 . . .	6	32	—

In drawing any conclusions from this table, it is, of course, necessary to take into account the exposure to which they were subjected, which has already been described, except as regards the last date. Between January and July they had been occasionally, but not very frequently, opened, and not much exposed to light. What little remained of C, after the January examination, had entirely evaporated before July. I have, therefore, not any evidence of the stability of the ethereal solution under long keeping.

Eight specimens, made by various formulæ in February, and examined again in July, had lost on an average 0·085 per cent. of H Cy, or about 5 per cent. of their original strength, two of the bottles having glass stoppers of ordinary quality, the others having common corks.

I do not observe any difference in the keeping quality of the samples prepared respectively with tartaric and with sulphuric acid; the latter, however, necessitates the use of spirit to precipitate the sulphate formed.

Looking over these experiments, the conclusions which they point to are, that the aqueous hydrocyanic acid does not lose by evaporation so rapidly as some recent essayists would have us believe; that the alcoholic acid loses strength less by evaporation than the aqueous; and that the ethereal acid suffers comparatively little from this cause. We also find that as extempore processes the decomposition of cyanide of silver by aqueous hydrochloric acid leaves nothing to be desired but economy; that crystallized cyanide of potassium may be obtained commercially pure enough for extemporizing hydrocyanic acid; and that it is permanent enough for practical use; that in the decomposition of cyanide of potassium by sulphuric or tartaric acid in the presence of alcohol only part of the cyanogen is liberated as hydrocyanic acid, but that after the precipitation of the potassium as an acid tartrate in the presence of a small quantity of water, the subsequent addition of alcohol or alcohol and ether yields an acid not deficient in strength; that crystallized cyanide of zinc and potassium may be substituted for the simple cyanide of potas-

sium with advantage, being free from deliquescence and tendency to decomposition on exposure to the air.

I may add that a common cork appears to be all that is necessary to prevent loss of acid by evaporation, and is probably better than a common glass stopper.

The following may be regarded as a cheap and easy method of extemporising hydrocyanic acid of B.P. strength:—

Water	1 ounce.
Cyanide of Zinc and Potassium	22 grains.
Tartaric Acid	49 „

Dissolve the cyanide in the water, add the acid, and allow the precipitate to subside; decant the clear liquor, and preserve it in a corked phial; renew the stock at intervals not exceeding three months.

My observations have only thrown a negative light upon the causes of the great variation found in the hydrocyanic acid of the shops, and leave us with the impression that something more to the point, both as regards causes and remedies, remains to be done.

SOME RECENTLY PROPOSED SUBSTITUTES FOR B.P. HYDROCYANIC ACID.

By W. A. SHENSTONE.

At a meeting of the Bristol Pharmaceutical Association, in December, 1873, a paper was read by Mr. Towerzey on hydrocyanic acid. The author gave, in his paper, the results of some experiments, which showed that the strength of the hydrocyanic acid used in pharmacy has not by any means improved since attention was first called to the subject by Dr. Tilden, in 1871, and he proposed as a substitute the double cyanide of zinc and potassium, adducing the result of an experiment to show that this compound has not the disadvantage of volatility. In the course of the discussion which followed the reading of this paper, Dr. Tilden suggested that experiments should be tried with an acid one-tenth the strength of that at present in use, as it seemed probable that the loss of strength through volatilization would be much decreased by the use of so weak a solution, and because there would be no necessity to obtain the prescriber's sanction to the use of such a preparation in the place of that ordered in the Pharmacopœia. I am aware that at the last meeting of the Conference, the use of a more dilute acid and

also of some of the metallic cyanides was proposed, and that averments of their greater stability were made in support of the several propositions; but as I have no knowledge of any experiments having been brought before English pharmacists, either on very dilute hydrocyanic acid or on solutions of metallic cyanides of a convenient strength, I have, during the past few months, endeavoured to carry out Dr. Tilden's suggestion, and have also given some attention to the zinc and potassium cyanide. It is the results of my experiments that I have to place before the members of the Conference.

Hydrocyanic Acid.—Some Scheele's acid, containing some free hydrochloric acid, was diluted, and the amount of HCN determined in two portions by the volumetric method with silver nitrate, the percentage found was .186, .185 respectively. Two other portions were placed in white glass bottles, one of them was closed with a stopper, the other merely covered over with unsized paper; each of them was about one-third full, and they were kept in the dark. At the end of a month the bottle covered with paper was perfectly free from hydrocyanic acid; this may have been the case earlier, but I was unable to examine it during the interval. The stoppered bottle was kept from March 28th to June 16th (two and a half months), during which period it was opened twelve times, the bottle being carefully inclined as it would be in pouring out a portion of the contents each time; there then remained .183 per cent. of HCN; an acid containing 2.28 per cent., under similar conditions, was reduced to 2.18 per cent., about three times as great a loss in proportion to the original strength of the solutions.

In my next experiments I kept the acid a much shorter time, but opened the bottles more frequently, that I might ascertain what depreciation of strength would occur when a bottle of the acid was frequently opened for removing part of its contents.

In each of six white glass-stoppered bottles was put some previously diluted acid, and the HCN determined in the first and last bottles filled; they contained .206, .204 per cent.

The four intermediate bottles, labelled A, B, C, D, were kept in the dark for one month, and opened A once, B twice, C three times, and D four times daily; on examining the contents, the following results were obtained:—

A opened 28 times, contained .202					
B	"	59	"	"	.192
C	"	84	"	"	.194
D	"	112	"	"	.195

From these numbers it would appear that when the percentage of hydrocyanic acid has been reduced to '195 or thereabouts, no further decrease in strength takes place from volatilization, unless the exposure to which it is subjected is very considerably in excess of what occurs in removing portions of the contents of the bottle holding it.

The second of my experiments indicates that when an acid of about '2 per cent. is kept in a well stoppered bottle, in the dark, and only occasionally opened, a very trifling loss occurs, and therefore it is evident that under these conditions the loss of strength by *decomposition* is unimportant. To decide whether this is also the case when the acid is exposed to light, two stoppered bottles, about one-third full of a solution containing '206 per cent. of HCN were taken; one of them was placed in diffuse daylight; the other in a window (on which the sun shone some hours almost daily) for a month: the strength of the first was then found to be '195 per cent., of the second '199.

These experimental results seem to me to prove that a solution of hydrocyanic acid thus diluted, has the advantage of being considerably less unstable than it is before dilution, and an additional point in its favour is, that it may be sucked up into a pipette with very little inconvenience and (taking ordinary care) without danger which enables one to dispense with a balance in estimating its strength. Mr. Siebold has pointed out, and I suppose all agree with him, that the strength of such a variable medicine should be frequently determined, but, unfortunately, though many are able to do this, only a few have the necessary appliances. In estimating the strength of this weak acid, the only absolute necessities are a pipette of 20 c.c. capacity, graduated in cubic centimetres (costing 1s. 6d.), and a standard solution of silver nitrate, containing 6.296 grammes of the nitrate in a litre, 20 c.c. of which will produce turbidity when added to 20 c.c. of a solution of hydrocyanic acid, containing '2 per cent. The necessary operations consist in measuring with the pipette 20 c.c. of the acid to be examined into a stoppered bottle containing a little solution of caustic soda, then rinsing the pipette, filling it to 0 with the silver solution, and dropping this into the bottle containing the hydrocyanic acid with constant agitation until the contents become turbid, the number of c.c. required to effect this, indicate the percentage. Thus, if 9 c.c. are required '09 per cent. of HCN is present; if 19 c.c., then the solution contains '19 per cent. of real acid. The whole process only occupies four or five minutes, and the results are sufficiently close

for practical purposes, as with care differences of $\cdot 005$ may be observed. In more accurate work, I measure the hydrocyanic acid in an ordinary pipette, and drop in the silver solution from a burette; there is a considerable saving of time even here, but more apparatus is required.

Zinc and Potassium Cyanide.—That a solution of this salt does not lose strength from volatilization is, I think, sufficiently proved. I have, therefore, only endeavoured to ascertain whether it is stable or not when in dilute solution. Three white glass bottles one-third full of a solution of the salt in water, containing an amount equivalent to 2·00 per cent. of hydrocyanic acid, were labelled A, B, C. A was placed in the dark, B in diffuse daylight, C in a window through which it was exposed to sunlight for several hours every day. Each of them was opened from time to time, perhaps twenty times in all, and they were kept for one month. At the end of that time the contents of A contained the equivalent of 2·00, B 2·00, C 2·01 per cent. of HCN; in short, no change had occurred.

Three similar bottles, containing a solution of the salt just one-tenth as strong as the above, were treated in exactly the same manner for the same length of time. On examination it was found that the contents of A contained the equivalent of $\cdot 198$, B $\cdot 199$, C $\cdot 199$ per cent. of HCN. The experiments were made during the hot weather of the present summer, and bottles C were at times quite hot to the touch. This, I think, shows pretty conclusively that zinc and potassium cyanide is an exceedingly stable compound, and would be much more reliable for medicinal use than the B.P. hydrocyanic acid, or, indeed, than the more dilute acid treated of in the first part of this paper. I doubt, however, if it would be legitimate to substitute it for the B.P. preparation without the consent of the prescriber, whereas, in the vast majority of cases where water is an ingredient in medicines containing hydrocyanic acid, the use of this diluted acid would be both legitimate and beneficial.

ON HYDROCYANIC ACID.

BY LOUIS SIEBOLD.

The variable nature of the diluted hydrocyanic acid of the B.P. has been so fully discussed that not another word is needed in proof of the very unsatisfactory condition of this powerful medicinal agent. But though the evil has been fully recognized, no sound remedy for it has as yet been suggested. The improved methods of storing and

dispensing the acid which have been proposed do not sufficiently prevent its volatilization, and do not even pretend to check its spontaneous decomposition. Several metallic cyanides have been proposed as substitutes for hydrocyanic acid on account of their greater stability; but unless we can induce the medical profession to forego the use of the acid in favour of such cyanides, we as chemists have no right to dispense them in its place, however fairly we may assume that their medicinal effect would be the same as that of the acid. Perhaps the best substitute of this kind would be the aqua laurocerasi or the aqua amygdalarum amarum of the *Pharmacopœa Germanica*, two preparations of equal strength, which, in Germany, are now exclusively prescribed instead of hydrocyanic acid, so that the latter is not even mentioned in that pharmacopœia. I alluded to the stability of aqua laurocerasi in the discussion which followed the reading of my paper on the officinal acids at the last meeting of the Conference, but I was not then in a position to state whether the greater stability of this preparation is due chiefly to the very diluted state of its hydrocyanic acid, or to the fact of the latter being present in it in organic combination. The solution of this question appears to me of importance, for though we have no right to substitute aqua laurocerasi for hydrocyanic acid, we are certainly entitled to dispense corresponding quantities of a pure but largely diluted hydrocyanic acid of known strength in place of the acid of the B.P., and it need only be proved that such a preparation is as stable or nearly as stable as aqua laurocerasi, to put an end to all our difficulties in reference to hydrocyanic acid, without any appeal to the medical profession.

With this view, I have undertaken a number of experiments, the results of which I have now the pleasure of communicating to the Conference.

A quantity of pure dilute hydrocyanic acid, B.P., was procured from a very respectable wholesale firm, and at once mixed with nineteen times its weight of distilled water. A careful gravimetric examination of this mixture proved it to contain 0.0957 per cent. of H Cy (the mean result of three determinations). A number of sixteen-ounce bottles were filled with this weak acid, and two of these bottles, marked 1 and 2, with the stoppers securely tied over with bladder, were put into a cool place, laid on their sides, and protected from the light. The other bottles were also kept in a dark cool place, but in a upright position, and these were opened three times every day, each time for about a quarter of a minute, and their contents examined, at first once every day and afterwards once

every week. These bottles were marked A, B, C, and D, and the samples of acid required for examination taken from each in its turn, so that a sample of A was examined on the second, a sample of B on the third, one of C on the fourth day, and finding no change a sample of D was tested at the end of a week, one of A after another week, and so on. 100 c.c. of the diluted acid were used for each determination, and were always measured in the same pipette. 5 c.c. of the normal solution of KHO were used in each experiment, and the standard solution of nitrate of silver containing one-tenth of a molecular weight of AgNO_3 in one litre was added each time, not only from the same burette, but from the same part of the burette, the instrument being refilled for every experiment. These precautions enabled me to obtain the most accurate results.

During the first three days, the acid was tested every day, but no change was observed in its strength. In each case 17.8 c.c. of the silver solution were required, indicating 0.0961 per cent. of HCN .

The acid was then examined from week to week, and the following results were obtained:—

	Used of solution of AgNO_3 .	Percentage of HCN .
During the first three days . . .	17.8 c.c.	0.0961
At the end of the 1st week . . .	17.7 c.c.	0.0955
„ „ 2nd „ . . .	17.6 c.c.	0.0950
„ „ 3rd „ . . .	17.5 c.c.	0.0945
„ „ 4th „ . . .	17.3 c.c.	0.0934
„ „ 5th „ . . .	17.0 c.c.	0.0918
„ „ 6th „ . . .	16.8 c.c.	0.0907

showing that the acid kept exceeding well for a month, though the bottles were opened three times every day.

The bottle marked No. 1 was opened a month after it was filled, and its contents examined, 100 c.c. required 17.8 c.c. of the silver solution. The bottle marked 2 was not opened until two months after being filled, when 17.6 c.c. of the AgNO_3 solution were required for 100 c.c. of its contents. The acid in these two bottles, which had been kept carefully closed, had undergone no appreciable change within two months.

On the strength of these experiments I venture to recommend wholesale houses to supply, and retail chemists to keep, a dilute hydrocyanic acid containing $\frac{1}{10}$ of a per cent. of HCN , of which 20 minims are equivalent to 1 minim of the B.P. acid. This preparation might be conveniently purchased and kept in 8 oz. bottles, of which one should be in use at a time, and replaced by a fresh one a month after it has been opened, provided it lasts

so long. The whole stock should be renewed as soon as the percentage of the acid becomes reduced to 0.095, which I feel sure would not be the case in less than three months, if the bottles be kept in a dark and cool place, laid down, and securely closed. In this simple and inexpensive manner we could make sure that the patient gets the exact dose of hydrocyanic acid intended by the prescriber, and we should thus remove one of the greatest and most serious anomalies of practical pharmacy.

Permit me now to offer a few remarks on Liebig's method of determining the strength of hydrocyanic acid. All who are practically familiar with this titrimetric method will, no doubt, be aware that the use of a large excess of KHO or NaHO , will make the result somewhat inaccurate, as in that case too much of the standard solution of AgNO_3 will be required to produce a permanent precipitate. The amount of alkali used should be slightly in excess of the quantity required for converting the HCN completely into KCN or NaCN ; and if very accurate results are desired for the purpose of comparison, as in the experiments I have quoted, the amount of alkali should be the same in each determination. But the error caused by the addition of too much alkali is small indeed compared to that resulting from the use of an insufficient quantity, and this is a point which, as far as I know, has never been alluded to in chemical literature. Let us bear in mind that Liebig's method is in reality a method for the estimation of KCN , but not of HCN , and that the use of less KHO than is required for the complete conversion of HCN into KCN must of necessity impair the result. The Pharmacopœia tells us to add sufficient NaHO to the acid to render the mixture alkaline, and this is precisely the statement which we find in the various books on chemistry and quantitative analysis. The mere use of sufficient alkali to produce a distinct or even a strong alkaline reaction, may lead an inexperienced analyst into serious errors, for the complete conversion of HCN into KCN or NaCN cannot be recognized by red litmus paper. I will give some practical instances. In each of the experiments above recorded 5 c.c. of a standard solution of KHO , containing a molecular weight in one litre, were used. Of this solution 3.5 c.c. would be required to convert the 0.0961 grams of HCN present in the 100 c.c. of diluted acid into KCN . But a much smaller quantity would suffice to produce a distinct alkaline reaction; $\frac{1}{2}$ c.c. instead of 3.5 would produce a distinct, 1 c.c. a strong, and $2\frac{1}{2}$ c.c. a very strong alkaline reaction, although in each case the acid would only be partially converted into KCN . A solution of KCN turns red

litmus paper blue, even in the presence of a large quantity of free hydrocyanic acid. If the standard solution of AgNO_3 is added to such a mixture of KCN and free HCN , a permanent precipitate is obtained as soon as the KCN has been converted into KAg_2CN , when the alkaline reaction will be found to have ceased, as the double cyanide has a neutral reaction. The following experiments will show the very erroneous results which may be caused by an insufficient use of alkali.

100 c.c. of the diluted acid, as before, were used for each experiment.

Standard solution of KHO added.	Reaction of the mixture.	Standard solution of AgNO_3 required to produce a per- manent precipitate.
$\frac{1}{2}$ c.c.	Alkaline	2.4 c.c.
1 c.c.	Strongly alkaline	5.1 „
$2\frac{1}{2}$ c.c.	Very strongly alkaline	12.3 „
$3\frac{1}{2}$ c.c.	do.	17.5 „
(The exact quantity required for converting the HCN into KCN .)		
5 c.c.	do.	17.8 „
(Containing a moderate excess of KHO .)		

In the first four experiments the mixture ceased to be alkaline after the addition of the AgNO_3 ; in the fifth it remained alkaline.

The number of c.c. of AgNO_3 used in each case corresponds almost exactly to the calculated quantity of KCN present, which clearly shows that the excess of HCN does not affect the result. It is interesting to observe that KCN and HCN can thus be accurately estimated in a mixture of the two.

I do not suppose that experienced analysts would be likely to make such serious mistakes in the determination of hydrocyanic acid as the above experiments show to result from the presence of too little alkali; but I feel sure that the less experienced chemist, who is accustomed to work strictly according to the recipe, having implicit confidence in the *modus operandi* prescribed by Liebig, Fresenius, and other eminent analysts, may very probably make such mistakes. Let it therefore be well understood that it is incorrect to use, as the books tell us, sufficient KHO or NaHO to render the mixture distinctly alkaline, or even strongly alkaline, but that the quantity of alkali should somewhat exceed, though only to a moderate extent, the amount required to convert the acid into a cyanide. If at the end of the experiment the mixture does not turn red litmus paper blue, the quantity of alkali used was insufficient, and the result of the analysis will be inaccurate. Should

the hydrocyanic acid contain HCl , as is frequently the case, it is evident that the inaccuracy caused by the use of too little alkali would be still increased.

As a rule the chemist will have some idea of the strength of the hydrocyanic acid he is testing; if he has not, a rough experiment with a large excess of KHO will give him one, and he may then calculate the amount of alkali required for an exact determination. An acid containing 2 per cent. or more should be very largely diluted with water in order to obtain a distinct end reaction. Liebig recommends the addition of five to eight volumes of water, but I believe that a much larger quantity (fifteen to twenty volumes) will be found preferable. A slight excess of alkali is useful or even necessary; a very large excess, however, impairs the result. I found that for every 10 c.c. of the solution of KHO which were added in excess of the required quantity, an additional 0.1 c.c. of the solution of AgNO_3 was required to produce a permanent precipitate, so that but a slight error will be caused in the result of the analysis by an excess of alkali which is not unreasonably large. The injurious influence of a very large excess of potash is pointed out in several handbooks on quantitative analysis, but no reference is made to the far more serious mistake of using too little alkali in any of the books or journals that have come under my notice.

THE PRESERVATION OF DILUTED HYDROCYANIC ACID.

BY JOHN WILLIAMS, F.C.S.

In an important paper by Mr. Towerzey, which was reported in the *Pharmaceutical Journal*, No. 183, page 509, attention was called to the very varying strength of hydrocyanic acid, as found in pharmacy. The author in fact concluded by recommending the disuse of the liquid acid altogether, and suggested the use of a definite salt, such as the double cyanide of zinc and potassium, in its place. To this suggestion there are, however, objections which it is not necessary I should discuss at present. But supposing the liquid acid to be continued in use, it is evidently most important that something should be done, if possible, to preserve and maintain it of a uniform strength, as the present preparation appears not to be reliable after being kept for any length of time.

Now, I have long been aware of the fact that glycerin has the

property of preserving hydrosulphuric acid (or sulphuretted hydrogen), and have been in the habit of making such a solution of the gas for some years. If an aqueous solution of the gas is exposed to light, in the course of twenty-four hours decomposition will have occurred, sulphur deposited, and all smell of sulphuretted hydrogen lost; but if to the water 25 to 50 per cent. of glycerin is added, and the liquid then charged with the gas, no change occurs even for months: some I have examined at the end of six months appearing to be as strong as ever.

Bearing this fact in mind, I determined to try if the same thing would happen with the somewhat analogous body hydrocyanic acid.

A preliminary experiment was made: a 50 per cent. solution of glycerin was charged with 2 per cent. of pure hydrocyanic acid, and at the same time a pure watery solution of the same strength was prepared. At the end of two weeks the solution in pure water was black and spoiled, and had lost the whole of its hydrocyanic acid, while that in the glycerin was colourless, and when tested was still of 2 per cent. strength. This result was so encouraging that I determined to make a series of more careful experiments, to determine not only for how long and to what extent the glycerin should act as a preservative, but also what the effect would be of different proportions of glycerin.

Before proceeding to refer to the results of my experiments, which are shown in the annexed tables, I ought to mention that comparative experiments were made with acid preserved in water in the ordinary way. The makers of hydrocyanic acid, as a rule, add to the acid as sold a small percentage of a mineral acid—generally hydrochloric acid. Without this addition, as I have already mentioned, the acid will not keep, even for a very short period. In the glycerin solution of the acid employed in my experiments, I need hardly say no mineral acid was added, and I found Price's glycerin better adapted for the purpose than some redistilled of foreign make. The latter caused the acid to assume a slight yellow colour, after a few days, although the strength did not appear to alter. The solution in Price's glycerin remained colourless to the end.

Two samples of hydrocyanic acid, both made exactly 2 per cent. in strength, the one in the usual acidulated water, the other containing 50 per cent. glycerin, were carefully tied over on January 26th, as shown in table 1. The bottles were kept cool, in the dark, and under the most favourable conditions for keeping. On April

26th, or after an interval of three months, they were again tested. The ordinary aqueous acid had become 1·80 per cent.; the acid with glycerin, 1·96. Thus the glycerin had acted almost perfectly, as the loss of $\frac{4}{100}$ ths is quite trifling, and practically of no importance.

At the same time an experiment shown in table 2 was made under reverse conditions. The samples of acid both made of accurate strength, on January 26th, were purposely left half filled, loosely stoppered, exposed to diffused light, and, in fact, in as unfavourable a condition for good keeping as could reasonably be devised. After an interval of two months the watery acid was found to have fallen to 1·80 per cent., and the glycerin to 1·96 only, but by April 26th, or at three months' interval, the watery acid had gone down to 1·32, while the glycerin had only fallen to 1·84. Thus the glycerin, even under these unfavourable circumstances, had preserved the acid comparatively well.

Table No. 3 shows the results of experiments made with glycerin of various strengths, and also with acid of much higher percentage than the ordinary medicinal acid of the Pharmacopœia.

The experiments commenced on March 26th. A 50 per cent. solution of glycerin was charged with 8·80 per cent. of hydrocyanic acid—also with 4·12 per cent., which may be taken as representing acid of Scheele's strength.

Also glycerin of 25 per cent. strength was charged with 13·68 per cent. of anhydrous acid, and also with 4·12 per cent. and 2·12 per cent.

Again, a solution of 15 per cent. of glycerin was charged with 16·24 per cent. of anhydrous acid, and also the same strength of glycerin with 2·12 per cent.

These various acids were tested at intervals of one month for three months, and the results are very instructive and interesting.

It will be observed that the weaker strengths of acid, both 2·12 and 4·12, have kept perfectly with all three strengths of glycerin, and show no change of strength during any of the testings. The stronger acids, however, show some change, especially at first. The 13·68 acid becomes 12·40 in a month, while the 16·24 acid becomes 15·20 in a month, 14·64 in two months, at which strength it remained at the end of the experiment. I ought to add that the bottles containing the acids used in these experiments were kept with every possible precaution, to preserve the acid as perfectly as possible.

It appears from these results that there is no advantage in

employing a large percentage of glycerin, 15 per cent. appearing to act as effectively as 50 per cent. I have lately prepared some acid with 20 per cent. glycerin, containing 2 per cent., $4\frac{1}{2}$ per cent., and of the high strength of 26.5 per cent., and shall take a future opportunity of reporting upon them. I think 20 per cent. glycerin would probably be the most convenient proportion for use, supposing it was considered desirable to authorize the use of glycerin for preserving the acid.

It is hardly necessary that I should state that, in performing these experiments, measured—not weighed—quantities of the acids to be tested were taken.

A comparative experiment was made between a white and blue glass bottle. The acid of the same strength preserved by glycerin was kept for two months in diffused daylight. The glycerin had acted equally well in each case—in fact, no difference could be detected, thus proving what has been long known to many, that blue bottles, however useful they may be as distinguishing hydrocyanic acid from other liquids in a dispensary, present no real advantage over white glass in the preservation of the acid.

It is not my wish to offer any opinion as to the propriety, “medically speaking,” of introducing glycerin with hydrocyanic acid; my object has simply been to see to what extent the glycerin can be made to act as a preservative of the acid, at any rate for a moderate period. The Pharmacopœia process of testing the acid was in all cases employed. I have to offer my thanks to Mr. Everson, who has performed the many testings required during these experiments with great zeal and care.

Table No. 1.

Real Hydrocyanic Acid.	Jan. 26th.	April 26th.
In water	2.00	1.80
In glycerin, 50 per cent. .	2.00	1.96

Table No. 2.

Real Hydrocyanic Acid.	Jan. 26th.	Mar. 26th.	April 26th.
In water	2.00	1.80	1.32
In glycerin, 50 per cent. .	2.00	1.96	1.84

Table No. 3.

	March 26th.	April 26th.	May 26th.	June 26th.
Glycerin, 50 per cent. {	8·80	8·56	8·56	8·56
	4·12	4·12	4·12	4·12
Glycerin, 25 per cent. {	13·68	12·40	12·40	12·40
	4·12	4·12	4·12	4·12
	2·12	2·12	2·12	2·12
Glycerin, 14 per cent. {	16·24	15·20	14·64	14·64
	2·12	2·12	2·12	2·12

The PRESIDENT; After these four very elaborate and able papers, I should imagine the question of hydrocyanic acid has been thoroughly threshed out, except that Mr. Williams has promised us a second report. Mr. Proctor's paper evidences a very great amount of research, such as he always displays. Mr. Siebold seems to me to have hit the right nail on the head, for I have always thought myself that the aqueous hydrocyanic acid of the Pharmacopœia is far too strong. It is a very dangerous thing, and a very little variation makes a vast difference in its effects. I do not see, except on the point of permanency, why we should use so strong an acid. Mr. Siebold finds that actually pure hydrocyanic acid, containing only one-tenth per cent. instead of 2 per cent., keeps remarkably well, and undergoes no change whatever. Mr. Williams seems rather to differ in this respect, and finds the addition of a mineral acid necessary to produce permanency. I fancy myself that a settlement of the question might be arrived at in this way—that the weaker acid of Mr. Siebold's might be employed preserved with the glycerin recommended by Mr. Williams, and that an acid preserved in that way would better meet the wants of pharmacy than the officinal acid now in use. I now ask you to accord a vote of thanks to the four writers of these valuable papers.

The vote of thanks passed unanimously.

Mr. RIMMINGTON: I must say, I think on the whole, there has been more attention paid to this subject than it really merits. I have never been a firm believer in the extraordinary changes that have been set forth, and I think it signifies very little in medicine if you have a change of one, two, or three units in the second figure of decimals. It is not a matter of practical importance; I may state as a result of my own experience, that I have made hydrocyanic acid

in some quantities for many years, and I can keep it three or four years with comparatively little change; indeed I have some which I had made twenty-five years ago, which is still good. I make a concentrated acid, and dilute it down to the standard of the Pharmacopœia or to Scheele's strength. Then you get the exact quantity, and may keep it for a long time. I quite agree with Mr. Proctor that a corked bottle is better than a stoppered one, because there is a much closer contact between the two surfaces.

The PRESIDENT: I believe myself that ether keeps better in a corked bottle than in one with a stopper.

Mr. RIMMINGTON: I think so, too, and I frequently recommend corked bottles for these very volatile fluids. I hope the gentlemen who have read these papers will not take it that I at all doubt their results; I am merely speaking from a practical point of view.

Mr. SCHACHT: I thought, as I heard Mr. Proctor's paper being read, I should like, in answer to one observation of his, that the assertion of the variability of this acid is somewhat exaggerated, to give my assurance of the absolute truth of the observations recorded by my then assistant and present partner, Mr. Towerzey. Those experiments, to which allusions have been made, were conducted by us both, and the observations of one were completely verified by those of the other, so that I am perfectly certain that those differences in strength, as reported by him, existed in the samples we examined. Some were taken from my own stock, and some were kindly lent or given us by our neighbours. As such changes do occur, I must confess I am a little surprised to find Mr. Rimmington express an opinion that such differences are of slight importance. One sample, which was positively being used by a gentleman, in his dispensary, contained only 0.12 per cent., which was very different from that of another gentleman, whose samples yielded 1.9 per cent., or, as nearly as possible, the correct standard solution. I think the most important contribution to this subject would be any suggestion which would enable us to keep something of the strength of Scheele's. The other part of the business might be easily settled by an occasional dilution of the stock of Scheele's to the strength of the Pharmacopœia, simply putting this into small bottles, keeping them downstairs, and using them one at a time as required. That is one way of easily meeting the difficulty, but we want to be pretty sure that we are not using Scheele's acid, which might happen to be in a stoppered bottle, but has gradually reduced to about half its strength. There, again, I must assure you I am not exaggerating the possibility of this action, for it really happened, that between two occasions of our

doing this in my own house, the last being only a week before I left, a change equal to that positively occurred; what was in the bottle about four weeks ago being of the strength of four per cent., and one week ago it had reduced itself to just one half. It was kept in our ware-room, and I am sorry to confess it was accidentally left on a high shelf, where it had no business to be, in an uncovered place, where the sun had made the upper stratum of air distinctly hotter than the lower. No doubt that was a mistake, but it shows the risks to which this preparation is liable. If the addition of glycerin would have the effect of preventing this evaporation—and I suppose its action is simply mechanical—it would be a great boon, because we should then probably be able to conserve our moderate stock with a tolerable certainty of finding it constant in strength. The suggestion which Dr. Tilden made at Bristol seemed to strike every one as a sensible way out of the difficulty, that inasmuch as our general experience showed that the strongest acids most readily parted with a portion of their potentiality by keeping, that if this acid were kept systematically reduced to one-tenth, it would be a strength which would be sufficient for medicinal purposes, and it could be preserved tolerably constant. That struck us as being an extremely sensible suggestion, and I am not surprised to find that Mr. Shenstone finds that strength is less liable to change than any stronger form. Still this little difficulty remains, that it would be very inconvenient to keep Winchester [quarts of hydrocyanic acid instead of smaller parcels. I should like to ask Mr. Williams if he thinks there is any mechanical effect produced by the glycerin. Of course when added to the sulphuretted hydrogen solution it would not be simply a mechanical effect; but in this case I should like to know if it is the mere thickness of the fluid which prevents the evaporation of the vaporous hydrocyanic acid.

Mr. WILLIAMS: That is a very difficult question to answer. I have thought a great deal upon the matter, and I have an idea it is connected with the diffusibility or the non-diffusibility of the menstruum in the air. For instance, glycerin is a non-volatile body, and it may be that it prevents the volatilization of the hydrocyanic acid, which is very volatile. So, with hydrosulphuric acid, it prevents it, or holds it in from its own inclination to diffuse into the air. It struck me that the cherry-laurel water, which is known to keep the acid much better than artificial hydrocyanic acid, probably owes its keeping property to having some essential oil or other body in the solution which is not diffusible in air to any extent. It is also an interesting fact that Mr. Proctor finds the acid to be best

preserved by ether, next by alcohol, and least by water, which is exactly the order of the diffusibility of the several vapours in air.

MR. SQUIRE: I am getting too old, gentlemen, to take part in these discussions, as formerly; but I might tell you what I practically found some forty years ago. At that time Scheele's prussic acid was very much in use, and the great objection to it was its loss of power by keeping; hence the 2 per cent. strength was adopted in the Pharmacopœia of 1836. At that time I used to manufacture prussic acid for the greater part of the trade in the city, and I remember Faraday holding up two bottles at the Royal Institution, and saying, "*This* is probably the pure acid, and *this* probably has had hydrochloric acid put into it." It so happened that the one which was colourless was mine, and I went to him afterwards and said, "There is no hydrochloric acid in that at all." He said, "When Davy and I operated on prussic acid we found that hydrochloric acid kept it very well." I said, "Still you must not jump to that conclusion, because, I believe myself, that prussic acid keeps best when perfectly pure, at the strength of 2 per cent." I have had an experience of something like thirty years of prussic acid, and I think if you have it pure and of the strength of 2 per cent., and keep it at a tolerably low temperature, it will keep very well. I bow to recent experience, especially of such men as Mr. Williams, but still I hold my own until I am set right; and, moreover, when we find a thing which has kept its ground since 1836, we should not be too ready to throw it over.

MR. GILES: We do not intend to throw over this strength, but to introduce it into mixtures in larger volume, and there will be no necessity for altering the Pharmacopœia for that purpose. In the paper this matter is discussed as a chemical question, and as such it appears to me to be settled, and that the difficulty can be met by diluting the solution. As to the question of the difficulty of keeping solutions in the state in which we obtain them, I think it is very easy, and I therefore agree with Mr. Rimmington, that, as a practical difficulty, it is much overrated. It appears to me that by moderate care, and by the exercise of common sense, you can easily keep dilute prussic acid within such slight bounds of variation as are unimportant, but I certainly should not keep it in the Winchester quarts, in the form in which I receive it. I always bottle it off into 4-oz. bottles, and it is brought into use in the pharmacy in quantities of twelve drachms at the time. A more interesting question is, How does the glycerin retain the hydrocyanic acid? I think it does that just as we find in other cases volatile or gaseous matters

are entangled by a viscid fluid, an illustration of which is the much longer time effervescence is retained in champagne than in soda-water.

Mr. ALLEN: Possibly the difficulty which has been referred to of keeping hydrocyanic acid from volatilizing might be got over by adopting a similar plan to that which I have found very useful in keeping a solution of sulphuretted hydrogen, and in keeping caustic soda away from the air. I keep them in an apparatus fitted, like a wash-bottle, with two tubes, covered with a layer of paraffin oil, which entirely excludes the atmosphere. When I want any out, I use a small syringe to blow some out through the wash-bottle tube, and if a little cap is kept over the orifice, there is no contact of the air at all, and I cannot imagine that any volatilization could occur in a case of that sort. Sulphuretted hydrogen keeps generally until the bottle is empty, though it gradually deposits some sulphur, I believe by a sort of secondary action. I think the same thing might be done with hydrocyanic acid, and if you do not like to use paraffin oil you might use olive oil, and in that manner keep it entirely from the air. As a pure chemist I have been much interested in Mr. Proctor's paper and his description of the method of preparing hydrocyanic acid from the different cyanides; certainly it seems very unnecessary to take such extreme precaution in preserving it, when you can prepare it so readily of any strength you want from cyanide of potassium or cyanide of zinc and potassium, by the action of tartaric acid. You thus get it very readily and perfectly pure. One other point struck me especially, in Mr. Siebold's paper, and that is the failure of litmus in indicating the real neutrality of the solution, which becomes alkaline with the least quantity of caustic alkali. I was puzzled for some minutes to know how Mr. Siebold ascertained whether he had enough soda there without actually calculating it, and I was very much pleased when he showed us that it was by the alkalinity of the solution on the completion of the operation.

Mr. SIEBOLD: I quite share Mr. Schacht's surprise that some gentlemen are still in doubt as to the great variability of the hydrocyanic acid of the Pharmacopœia. It is evident that either the gentlemen who have so far published the results are not reliable, and their results are false, or else the acid is very variable. If it is so, the question now proposed to the Conference is, I believe, one of the highest importance, considering the powerful nature of hydrocyanic acid as a medicinal agent. I believe everything in our power should be done to remedy the evil which has existed so far, and it

is much better we should remedy it by our own experience than that it should be done at the dictation of magistrates, or public analysts, or police inspectors. There are two causes of the deterioration of hydrocyanic acid: one is volatilization, and the other, spontaneous decomposition. The loss by evaporation is, no doubt, the greater. As to the addition of hydrochloric acid to preserve it, opinions have differed at all times. It has been maintained by eminent men that the addition is useful or necessary, whilst others equally eminent have disputed it, not only on theoretical but also on practical grounds. I believe the discrepancy may be explained in this way:—Last year Mr. Rimmington pointed out that hydrocyanic acid acts upon the alkali in the glass of some bottles; that some glass readily yields its alkali to weak acids, and whenever the hydrocyanic acid is put in such a bottle, there cannot be a doubt that the addition of hydrochloric acid is of extreme value, because the alkali would be more readily yielded to hydrochloric acid than to the hydrocyanic acid. I have experimented on bottles of various kinds, and I believe I am justified in saying that the addition of hydrochloric acid is perfectly useless except in the case I have referred to, and my experience agrees with that of Mr. Squire, that the pure acid does not change any more without the hydrochloric acid than with it. But I cannot see any objection to the scheme proposed of storing hydrocyanic acid in a diluted form. I used to make large quantities of cherry laurel water in Hamburgh, half-a-hundredweight at a time, and that was kept in bottles of one pound each; at the end of the year there was no appreciable deterioration in its strength. My experiments now show that the highly diluted form of hydrocyanic acid will keep as well, or almost as well, as the cherry laurel water. Why, then, should it not take the place of the more concentrated form? I do not think myself that the cherry laurel water ought to take its place, but if we have a simple solution in water we are in the same position as using a solution of a common mineral salt in dispensing instead of using the salt itself. For instance, if five minims of the acid are prescribed, and our acid contains $\frac{1}{6}$ per cent., we must use 100 minims. We act in a similar manner continually in the case of bichloride of mercury, sulphate of magnesia, morphia, and other substances.

The PRESIDENT: How would you do in the case of concentrated medicines, where so many drops are ordered to the teaspoonful? The dilute acid would not be applicable to such a case. Pharmacists, however, should not encourage the prescribing of "drops."

Mr. SIEBOLD: I believe this would rarely occur in the case of

hydrocyanic acid. There is another objection as to the dose. In the Pharmacopœia it is from two to eight minims, which is very large when compared with the largest dose permitted to be used in Germany. As I have said, the German Pharmacopœia does not contain hydrocyanic acid, but cherry-laurel water, and the largest dose of that substance allowed to be prescribed is half a drachm, which is equivalent to the smallest dose of the hydrocyanic acid of the British Pharmacopœia. This is certainly a great anomaly, which may be explained by assuming that in fixing the highest dose of eight minims, experiments may have been relied upon which had been made with an acid which had become greatly deteriorated in strength. We continually meet with acids containing less than one per cent., and very seldom does it contain anything like two per cent., unless freshly made. We have no proof whatever that these hospital experiments were not made with a weak acid; and, at any rate, it seems to me a great anomaly that in England the largest dose should be eight minims, whilst in Germany it should be only equivalent to about two. I cannot suppose that there is such a difference in the constitution of Englishmen and Germans as to allow the former to take four times as much as the latter.

THE ANALYSIS OF BUTTER.

The PRESIDENT: After the reading of Mr. Stoddart's paper yesterday (see page 544), I understand that a wish was expressed on the part of some gentlemen, especially interested in the question as analysts, to hear further details. Mr. Stoddart has this morning been kind enough to repeat his experiments in our presence, and he will now exhibit the results.

Mr. STODDART: After leaving here last night, it was intimated to me that some of my results could not be correct, and to show you that they were correct, I thought I had better bring you the same experiment this morning. The consequence is, I have analyzed part of my breakfast. In this tube is the milk which I poured out of the milk jug. At the bottom is the casein, and here are the salts. It is a very good milk, because it has four lines of fat, which is equal to 6.64 per cent. by weight of fat. Then I took a small pat of butter, which is in this tube, and it appears to be really pure butter. This deposit at the bottom is simply curd, which arises from the butter not being well washed—there is no adulterant. Here, on the other hand, is one which has 25 per cent. of something like lard in it. Here is the butter at the top, and the bottom

is the white layer of lard. In this case you see there is no curd. This distinctly proves the value of these tubes, and that you may rely upon them. Mr. Squire has repeated the experiment, and has found it quite correct. I was asked yesterday, by Dr. Redwood, how you could distinguish fat from butter, and I replied that you could do so by ether. The bottle that I have this adulterated butter in was shaken up with ether, and at the bottom of the phial bottle you can distinctly see the difference between the two. The yellow butter is at the top; of course it is coloured with annatto, or something of that sort, and the white sediment at the bottom is lard. When I mixed pure lard with ether, and held it in my hand, it was as clear and limpid as water. But when it got cold the lard entirely separated, showing that cold ether will not dissolve lard. So that if you avoid any warmth, of the hand or otherwise, you will find that ether will dissolve butter, but not lard. Of course I do not go so far as to say that an artificial butter could not be mixed up, as described by Mr. Wanklyn, which I could not detect. I do not profess to know every fat that is made; I only say that, with the ordinary fats that are used, ether will distinguish between the two.

Professor REDWOOD: I am much obliged to Mr. Stoddart for having taken the trouble to demonstrate the fact which he has just put before the meeting, and which certainly, to some extent, is satisfactory; but I wish, however, just to put the matter to him in rather a different form from that in which he has explained it—probably somewhat in the form that he has referred to as having been adopted by Mr. Wanklyn. Of course we should all be ready to admit that there may be an adulteration of butter that may be detected by this or by other means; that is, there may be a fat, as I put it last evening, which would differ entirely in composition from the ordinary fat of butter—differ in the proportion of the constituent parts of the stearin, and palmitin, and olein, and which, therefore would have a different melting-point; and seeing that the stearin and palmitin are not acted upon by solvents in the same way and to the same extent that olein is, it would be quite possible to indicate the presence of a fat of that description; suet, for instance, would be very easily detected. But what I meant to say, and what I still hold, is this, that if the butter, instead of being clumsily adulterated, has been dexterously adulterated, and if the foreign fat which has been introduced, is a fat having a similar composition to the butter fat (that is to say, if the proximate constituents are present in the same proportions as in ordinary butter), then it still remains to be shown how their presence is to be indicated. And I say,

as I said yesterday, that if this method will indicate the presence of foreign fats in that way, it certainly will be a great step in advance. I think I understood Mr. Stoddart to say that, in one case, where lard had been treated with ether in the same way, it entirely separated. Now, I should like to ask him if there is absolute evidence of the entire separation of the whole of the lard.

The PRESIDENT: In this tube the lard appears partly in solution and partly not.

Professor REDWOOD: The question would amount to this: is it not the separation of the crystalline and more solid fats, which are less soluble in the ether than the others?

Mr. ALLEN: I have taken a great interest in this explanation by Mr. Stoddart of Mr. Horsley's ingenious apparatus. When Mr. Horsley first published his pamphlet, he sent me a copy, and I very carefully tried this experiment myself, but I must say I did not succeed. I never could get the butter fat to assume this peculiar form in the tube; it always formed a spheroidal globule, so that I could not read it off. However, it is evident that in some way my manipulation was faulty, since Mr. Stoddart has succeeded very capitally. He told us just now that the milk he had for breakfast had upwards of six per cent. of butter fat in it; but it is a curious thing that when you estimate fat in other ways it does not yield more than three or three and a half per cent.; therefore, I should like to know why it is we have upwards of six per cent. estimated in this way. It is very evident, I think, that the fat is not pure; it is liquid at ordinary temperatures, and shakes about in the tube in a very different manner to oil, and it is evident to me that it contains something else, I presume a mixture of ether not thoroughly separated. I presume, therefore, that in order to get the exact amount of the fat, we ought to drive off the ether, and dry it. With respect to the application of ether for the distinguishing of other fats in butter, I have used ether myself very frequently, and believe it is a most useful test for the purpose, and this seems a nice way of applying it; but I quite agree with Dr. Redwood that it is merely a question of stearin, which is the principal constituent of suet and lard, being less soluble in cold ether than the olein and butyryn contained in butter. To say that lard is not soluble in cold ether is merely to say that stearin is sparingly soluble in cold ether, and I think if Mr. Stoddart takes a given quantity of lard, and shakes it up in a given quantity of ether, he will find a portion of it will dissolve even in the cold ether. Then comes the question, if you have fats of the same constitution as this in butter, how are you to re-

cognize the existence of foreign fats? You must remember that butter is peculiar in containing butyrim, that is, butyrate of glycol. That is not found in any other animal fats; and it has been proposed, I think by an assistant of Dr. Hassall, to get an idea of the amount of butter in any mixture on this principle. If we saponify olein and stearin, we obtain a certain amount, I think about 95 per cent., of solid stearic acid. Now, if we take butter, we only get about 85 per cent. by weight in the form of insoluble fatty acids; therefore, there is a clear 10 per cent. difference to work upon. If we have butter we ought not to have more than 85 per cent., but if we have a mixture of foreign fats, it would go from that up to 95 per cent.

Mr. Ekin: I was rather surprised to hear Mr. Allen say that he found any difficulty in working that apparatus, because since Mr. Stoddart brought it under my notice I have tried it several times, and have never had the slightest difficulty. I cannot think that Mr. Horsley's directions have been properly followed, or there would have been no failure. Then as to the discrepancy Mr. Allen finds between his measure of the oil and the weight, I have checked it over and over again by weighing it, and found it quite accurate. Mr. Horsley tells you that a certain measure weighs so much, and that I have checked on several occasions, and found perfectly accurate. He says nothing in his pamphlet about butter, and that application of his apparatus is entirely due to Mr. Stoddart. The fact is indisputable that though we may talk very learnedly about stearin, butyrim, and so on, practically Mr. Stoddart has been doing for months now what I perceive, by reports in the papers, London analysts have not been able to do; he has condemned, and on the strongest grounds, I think, several samples of butter, and the consequence is that Somersetshire, at any rate, gets the benefit of it, for the butter supply is considerably improved there. I must add that I have been exceedingly struck with the extreme readiness with which Mr. Stoddart always imparts any fresh knowledge he obtains to others. Indeed, he seems to take the greatest pleasure in doing so.

Mr. Allen: I should like to explain to Mr. Ekin, with regard to the proportion of weight and volume, that what I meant was this:—When we hear of upwards of 6 per cent. of butter fat being found in milk, I say that milk does not contain that amount, and therefore it is evident it must not be taken by the volume there. It may be that the volume always bears a certain proportion to its weight, but you cannot actually estimate the percentage in such a way, because it is quite certain there is not 6 per cent. of fat in milk.

Mr. EKin : I maintain that the volume of the oil is in direct and constant relation to the weight of pure butter fat.

Mr. ESTCOURT : I understood Mr. Stoddart to say there was 6 per cent. by weight of fat in that milk. Now I believe that percentage has never yet been found.

The PRESIDENT : May I ask Mr. Ekin whether he carefully dried the fat, and drove off any trace of ether there might be present in it before weighing ?

Mr. EKin : Yes ; on several occasions. The fat was dried in a platinum capsule on a water-bath, until it ceased to lose weight.

Mr. ALLEN : What weight does it dry to ? It does not dry so as to leave you 6 per cent. of dry fat ?

Mr. EKin : The percentage of fat of course varies in different samples of milk. All I say is, that there is a constant relation between the weight and the measure, and that what Mr. Horsley states is correct.

Mr. STODDART : I do not know whether Mr. Allen was present yesterday, but if he had been I do not think he would have said what he has. To say that milk has not 6 per cent. by weight of fat, is not correct, for Alderney cows to begin with, for I have cows at home which I milk myself that had 25 per cent. of cream thrown up according to the usual lactometer, and that which I brought up the day before yesterday in one of these tubes, showed 6 per cent. of fat in it. I then put 50 per cent. of water in the next tube to that, and that showed exactly two lines, whilst that with 25 per cent. of water showed exactly three lines. In a fourth tube I skimmed off the cream, and put 50 per cent. of water, and that showed one line. This process, therefore, is very consistent. I have tried it over and over again, thirty or forty times, and I really must say that if Dr. Voelcker, for instance, has any cows that do not agree with ours, he had better send them down to Somersetshire. There is such a tremendous difference of result between the London chemists' and Mr. Ekin's and my own examinations, that we cannot explain it at all. We can only suppose that our cows must be fed on better material, or that they are a different kind of animal. With regard to the fat in butter, I would ask Professor Redwood what fat there is that would resemble butter so closely, because I am not aware of any. I must confess that I had something to do with butter manufacture about ten years ago, and know something about it. In the first place you do not get absolutely pure lard ; what is sold for lard being simply pieces of meat boiled in water and the fat skimmed off. To adulterate butter you must

have something that pays ; it will not do to make an expensive fat for this purpose ; and I am not aware of anything that is cheaper except what I came across some months ago, when I found that a glue manufacturer was melting up the bits cut off the skins and selling it to mix with butter. I know, as a truth, that three hundred tins of butter were sent out of England about eight years ago, which only had thirty per cent. of butter in it, and about ten months afterwards an order came back for a repetition of the cargo, with the order that it was to be exactly the same quality, because it was so much approved of. Now, such a thing as that must have been easily detected. I have had a lot of French butter in my laboratory, which has made quite a mess in the place from the water and salt running out at the bottom. Speaking practically, it would not pay to put less than 20 per cent. of fat into butter, and if you have such a mixture, and shake that up in a phial with cold ether, holding it by the neck so as not to warm it, if it is pure it will dissolve perfectly, but if there is anything foreign in it, it will go to the bottom. The only ground for mistake is this, that butter sold in the country very frequently has a quantity of whey with it, and thus you may have a curd going to the bottom. But that may easily be determined by putting a little on a glass slip, and warming it. These experiments prove that two things in our ordinary books are wrong. First, that ether will not remove fat from milk, because here we see that it does so ; and on the other hand I am satisfied that lard, or any other fat that I am aware of in the meat way, will not dissolve in cold ether. When I put the lard into some of Mr. Squire's ether just now, it was as clear as the water, because I held it in my hand, but in two or three minutes, when it got cold, it all separated.

Mr. LINFORD : Dr. Redwood alluded just now to the possibility of adulterating butter scientifically, and I may mention that not long ago I had the opportunity of seeing beef suet treated in such a way that its melting point was reduced to within two degrees of that of butter, and the consistency was almost the same as butter, so that with the addition of a very little butter to it, it was exceedingly difficult to tell that you were not eating good fresh butter. In that instance, pure fresh beef suet was used. Now, the question arises, how the alteration was made in the suet ; that I was not able to learn, but it struck me it was attained in this way. We all know that if a piece of fresh meat containing fat is boiled, and the fat skimmed off, the fat becomes soft and does not set hard, whereas, if the same fat be boiled in plain water without the lean meat, when

the cake of fat is taken off it sets as hard as tallow. Now, I have very little doubt that whatever substance it is in the meat that prevents the fat acquiring the same melting point, was that which was made use of in this article. It is now exported very largely to France, and sold as *beurre de cuisine*, and I believe a large proportion of it is reimported, and comes back here as the best Ostend butter. It would be interesting to find out if Mr. Stoddart could distinguish this from the ordinary butter as well as the lard.

Mr. ESTCOURT: I wish to call attention to the fact that Mr. Horsley gives himself as the quantity of fat in average milk, 3.32 per cent., and I should like to know how Mr. Stoddart arrives at his result of 6 per cent. by weight.

Mr. STODDART: The average of milk is certainly 3.32. I do not say that this sample I have here is the average, I only say it is the simple fact that it contains 6 per cent.

The Conference then adjourned for luncheon.

On re-assembling at two o'clock, the first paper read was on—

LIQUID EXTRACT OF SARSAPARILLA.

By H. BARTON.

At the present time sarsaparilla does not appear to sustain the high position once held by it as a remedial agent, and the question arises, were its reputed good qualities a delusion, or are the usual preparations of it defective? Looking into the older compendiums of pharmacy, such as Dr. Jourdan's *Pharmacopœia Universalis*, it becomes strikingly apparent that considerable boiling was thought an essential, and it is beyond question that well boiled decoctions were in great favour; but when it became necessary to meet the demand for concentrated preparations, or liquors, it was, and with good reason, supposed that, however well decocting might exhaust the root, the continued application of heat dissipated into the surrounding atmosphere much of its peculiar aroma; also after a time the concentrated decoctions deposited in considerable quantity a something which would, most likely, contain further portions of their active properties. I used to dispense a much prized old prescription, written by the late Dr. Scott, of Bromley, principally, *pulvis radice sarsæ*, the verbal instruction to the patient having been, "Mind where you get this, and do not be persuaded to take any of the concentrated decoctions; I have no faith in them."

We now come to the truly "elegant extracts," the preparation *par*

excellence for appearance and good-keeping qualifications, those made by cold or moderately hot infusion and careful evaporation leaving, so far as appearance is concerned, nothing to be desired; but, looked at in the light of a more than usually interesting reprint, which appeared in the *Pharmaceutical Journal* some thirty-one years ago, of a paper read by Mr. T. J. Husband, of the Philadelphia College of Pharmacy, I much fear these "elegant extracts" are at the bottom of the present lukewarm reputation to which, in this country, the drug has descended. Mr. Husband advocated the use of alcohol in the processes for preparations of sarsaparilla, and expressed fear that the permission to make compound syrup by a cold water method would result in the destruction of its valuable character. His experiments and the report of the committee to whom his paper was referred, appear well worthy of reperusal and consideration at the present time. Bearing them in mind, I have for the last ten years departed somewhat from the *letter* of the official process, and thrown rather more *spirit* into the fluid extract in the following manner:—Each ten pounds of select fibrous root, after being dried and coarsely powdered at a loss of about 8 per cent., has been equally moistened with a gallon of dilute alcohol, containing 25 per cent. of 60 over-proof spirit, and set aside for ten days, then pressed, giving up 65 to 68 ounces of fluid, the pressed root well worked up with five gallons of water at 160°, set aside for about sixteen hours, and again pressed, the watery solution decanted and evaporated to about ten pounds, filtered, and further reduced to make, with the spirituous portion, 80 fluid ounces. Prepared in this way the liquid extract retains more of the taste and smell of sarsaparilla than a liquor made in strict accordance with the letter would do; still to my mind it is not a satisfactory preparation, nor in any respect equal to the following unorthodox sample:—

Take 40 ounces similar root, dried and coarsely powdered, moisten with 40 ounces *proof spirit*, set aside ten days, press from it 20 ounces; macerate the pressed root for sixteen hours with 15 pounds of water at 160°, press, decant the liquid into a water-bath, adding 8 ounces of sugar, and evaporate to produce, with the spirit portion, 40 ounces, each ℥℥ representing 3j of the root. Thus prepared, the proof spirit is very much charged with the odour and taste of sarsaparilla, and has to a high degree the frothing characteristic; again the addition of a little sugar to the aqueous solution exerts a marked influence during evaporation, filtering being unnecessary, the finished product depositing scarcely anything. It may be said there is considerable loss of spirit; loss I admit, but waste I do not think;

that remaining in the bulky pressed powder, is rapidly diffused in the hot water, and although dissipated during subsequent evaporation, would leave in the saccharated solution what it had dissolved. One further experiment: one lb. transversely cut selected root was digested as directed in the Pharmacopœia in two waters at 160°, kept hot during the twelve hours; the second portion pressed away by hydraulic force to exhaust the root so far as this process can do so; the liquid reduced in a water-bath, at a temperature never exceeding 165°, to make with the spirit f3viij. The root having been redried and bruised was moistened with 16 oz. proof spirit, set aside four days, when it was again pressed, and from it obtained a fluid, a little of which, added to water and shaken, froths up, developing the odour in a decided degree; or a few drops tasted, leaves upon the palate a persistent rather than pungent taste, showing that digestion with seventeen and a half times its weight of water at 160°, and pressed away by a force not always applied in practice, still leaves the root retaining much that we should suppose ought to have been in the "extractum sarsæ liquidum."

The PRESIDENT: We have to thank Mr. Barton for an account of the experiments he has carried out, as I have no doubt you will do. The preparation, made by treating the root first with proof spirit, and subsequently with water and sugar, appears to me to be a very capital sample of liquor sarsæ; it contains more of the active principle than usual, which I think depends upon saponin. I think it is that which causes that frothing and also that turbidity when a sarsaparilla preparation is treated with an acid. I have long been of opinion that the comparative value of sarsaparilla preparations would be indicated by the amount of turbidity caused by acidulating them with hydrochloric acid. There is no doubt that in southern countries the use of sarsaparilla is attended with far more benefit than it is here. In many cases it, and nothing else, is used for the cure of syphilis.

The vote of thanks was passed unanimously.

The next paper read was—

• A NOTE ON THE ADMINISTRATION OF PHOSPHORUS.

By JOHN WILLIAMS, F.C.S.

A short time since I had occasion to prepare a solution of phosphorus in mixed alcohol and glycerin. The form is given, though

not quite accurately, in the *Pharmaceutical Journal*, No. 191, page 684; but practically it may be considered to be a solution of 12 grains of phosphorus in nine fluid oz. of alcohol, to which nine fluid oz. of glycerin is afterwards added; it consequently should contain $\frac{1}{12}$ th grain of phosphorus to each fluid drachm.

The solution of the phosphorus in alcohol is not easily effected; in the cold, alcohol hardly acts upon the phosphorus. To effect the solution it is necessary that the alcohol should be heated, and kept at a temperature rather under its boiling point until the solution is complete. I find it requires from 12 to 24 hours to dissolve the 12 grains of phosphorus in the nine oz. of alcohol, and it must be done either in a flask or retort so arranged as to condense and retain the spirit. A flask immersed in a water-bath, fitted with a good cork, through which passes a long narrow tube, three or four feet long, answers very well, the alcohol condensing in the tube, and dropping back into the flask, and unless the alcohol is made to actually boil, the loss of the spirit is quite trifling.

This process is of course a very tedious and troublesome one, and it struck me it might be possible to materially simplify it by reversing the mode of proceeding, and upon trial it was found that hot glycerin easily dissolves phosphorus, although most of it is deposited on the cooling of the glycerin. Still some is retained in solution, as can be proved by adding it to a solution of chloride of gold, when purple gold is at once precipitated.

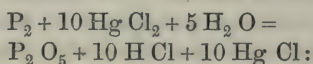
To make the solution of phosphorus, therefore, 12 grains of phosphorus were dissolved by shaking for a few minutes in nine fluid ounces of pure glycerin, heated in a bottle sufficiently large to hold three times the quantity, and then the absolute alcohol, previously heated to an equal temperature, was added, and the whole well shaken for a few minutes. In this way a perfect solution was effected in as many minutes as it required hours to do it by the other process; but it was found, that although the solution was perfect at first, some phosphorus was always deposited by standing for about 12 hours. This was very puzzling, and led me to examine the two solutions more carefully, as it was evident that 12 grains of pure phosphorus was more than could be held in solution by 18 fluid ounces of mixed glycerin and absolute alcohol.

Upon testing the two liquids diluted with water, it was found that the alcoholic solution of phosphorus was highly acid, while the recently prepared glycerin solution hardly reddened litmus paper: thus proving, what might have been predicted, that a large proportion of the phosphorus was oxidized during the long diges-

tion in hot alcohol, while that hardly occurred in the glycerin solution.

I have attempted to determine the quantity of real phosphorus (unoxidized) retained in the two solutions, and although my experiments have not proved quite conclusive, they still possess some interest.

If we add a solution of phosphorus to bichloride of mercury, reduction occurs on boiling, and calomel is precipitated. If we suppose phosphorus becomes entirely phosphoric acid, and that the precipitate is entirely calomel, as shown in the following equation—



then 62 grains of phosphorus should produce 2350 grains of calomel, or one grain of phosphorus = 37·9 of calomel. Of course the amount of oxidation of the phosphorus ought to be shown by the deficiency in the amount of calomel produced; and as each fluid ounce of the solution of phosphorus is calculated to contain $\frac{2}{3}$ grain of that body, we ought to obtain, in round numbers, 25 grains of calomel from that quantity.

A trial was made by dissolving five grains of phosphorus in sufficient alcohol as rapidly as possible, and with the least possible exposure to air. It should have yielded 188·6 grains of calomel—it only yielded 131·0 grains; thus nearly one third of the phosphorus was oxidized.

In another instance, where the solution had been effected in a large flask, and had required application of heat during 24 hours, the amount of calomel produced from the solution of $\frac{2}{3}$ grain of phosphorus, instead of being 25 grains, as theory indicated, only gave 4 grains, thus proving that hardly any phosphorus as such remained in the solution.

Testing the glycerin solution of phosphorus prepared as previously described, and after it had deposited its excess of phosphorus, I obtained 11 grains of calomel from one ounce instead of 25 grains, which it ought to have yielded had the whole of the phosphorus remained in the liquid. This would show that rather more than half the phosphorus is deposited, and that $\frac{1}{24}$ grain is nearer the quantity which can be held in solution in an unoxidized condition than $\frac{1}{18}$ grain.

However, there are several reasons why the results of these experiments are not conclusive. Not only phosphorus itself, but the

lower oxides of phosphorus, equally reduce chloride of mercury; and although I thought I might have been able to obtain some constant by which I could calculate the proportion between the unoxidized and the oxidized phosphorus, I have not succeeded in doing so. We must also remember that the precipitate may consist partly of phosphate of mercury; and I think it likely if the phosphorus has been oxidized to the state of hypophosphorous acid, that some at least of the mercury might form hypophosphite of mercury, and thus remain in solution, and this may account for the very low percentage of calomel I have sometimes obtained.

Considering the whole matter, however, I think the glycerinic solution of the phosphorus a very good and advantageous form of exhibiting this element; that it contains the phosphorus in an unoxidized condition is easily proved by adding some to water, when the phosphorus is separated in a milky form. The taste also is very marked, for, although sweetened somewhat by the glycerin, the strong garlic-like flavour of the phosphorus is very pronounced.

I think if such a solution as I have described should be employed in medicine, caution should be used as to the dose to be administered, as I am strongly of opinion that many of the preparations in use, and supposed to contain a certain percentage of real phosphorus, would, if carefully examined, prove to contain it in a condition more or less oxidized, and thus medical men may have been deceived as to the real maximum dose proper to be administered.

A vote of thanks was passed to Mr. Williams.

The PRESIDENT: The use of phosphorus is now becoming very general, I suppose from our overtaxed brains requiring a little stimulus of that kind. I hope, therefore, that Mr. Williams' experiments will tend to make its exhibition more controllable than it has hitherto been.

Mr. UMNEY: I look upon Mr. Williams' experiments as very valuable. I should like to ask him whether he subjected the alcohol to any special treatment before he made these experiments, in order to determine whether it contained any acetic acid, aldehyde, or any of the other bodies which are frequently present in alcohol.

Mr. WILLIAMS: I used pure absolute alcohol, not ordinary spirit.

Mr. MARTINDALE: The disagreeable taste of phosphorus when administered in a liquid form is objectionable, but the glycerin

solution seems to be a very elegant method of giving it. I did not quite catch the strength which Mr. Williams would recommend.

Mr. WILLIAMS: I believe the right strength which can be made practically is from $\frac{1}{30}$ th to $\frac{1}{24}$ th grain in each drachm of absolute alcohol and glycerin in equal parts.

The PRESIDENT: What is the medicinal dose?

Mr. WILLIAMS: From $\frac{1}{30}$ th grain to $\frac{1}{10}$ th grain, but I should be inclined to take a somewhat smaller dose.

The PRESIDENT: That would be about one drachm of the glycerin solution to a dose.

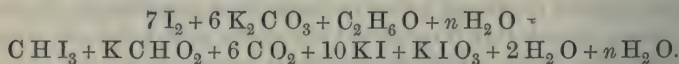
THE UTILIZATION OF IODOFORM RESIDUES.

By EDWARD SMITH, F.C.S.

Iodoform or tri-iodomethane (CHI_3) may be obtained by the action of iodine and caustic or carbonated alkalies on ethyl alcohol, acetone, aldehyde, and several bodies. It is, I believe, very generally prepared according to the well known formula of Wittstein, by heating in a water-bath a mixture of iodine, ethyl alcohol, potassium carbonate, and water, until the reaction is completed, and the liquid colourless. Wittstein does not recommend any particular temperature, other than that of a water-bath, but says, "The receiver must during the operation be well cooled."

I have found that if the temperature is kept down to 68° – 70° C., there is no necessity to attach a receiver, since but very few cubic centimetres of condensable bodies pass over. I use a glass flask fitted with a thoroughly sound cork, through which passes a long tube protruding half an inch or so into the flask, and exteriorly bent at an obtuse angle, so that any fluid condensed in the tube runs back into the flask.

The yield of iodoform is from 16 to 17 per cent. of the weight of iodine employed. The reaction is somewhat complicated, but may be written thus:—



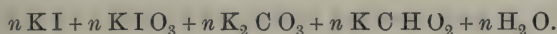
This does not express the exact reaction, for then seven molecules of iodine should yield one molecule of iodoform; or about 21 per cent. of iodine employed should be utilized in building up iodoform, but this percentage is never reached in practice. Five-sixths ($\frac{5}{6}$)

of the iodine is found in the filtrate from iodoform as iodide and iodate of potassium, together with some little potassium formate, produced during the operation, and the excess of potassium carbonate. Wittstein secures the iodine in this residue by evaporating to dryness and heating to redness with "powdered wood charcoal," digesting with alcohol, filtering, and evaporating to crystallization. This answers well when large quantities are operated upon, but, upon a small scale, such as most pharmacists would undertake, the iodide does not come out well.

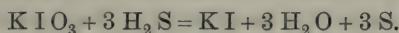
Rother (*Pharm. Journ.*, 3rd series, iv., 594) has propounded a method of overcoming some of these difficulties, by freeing the iodine in the residue by an acid in conjunction with acid potassium chromate: more iodine and potassium carbonate are then added, and the mixture heated. In this way successive crops of iodoform are obtained, the last filtrate, however, still holding iodine.

The process I have devised, and successfully employed many times, to secure the whole of the iodine in a useful form from the filtrate, is as follows:—

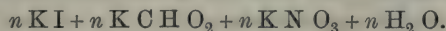
The filtrate from the iodoform consists essentially of—



If now a stream of sulphuretted hydrogen be passed through the solution the iodate is reduced to iodide, and sulphur is precipitated, according to the equation:—



The solution is now gently warmed to expel excess of sulphuretted hydrogen, filtered to remove sulphur, and whilst warm, cautiously neutralized with nitric acid, to drive off the carbon dioxide from the potassium carbonate. We now have in solution simply:—



To this is now added lead nitrate until all the iodine is precipitated:—



If by chance the PbI_2 should carry down a trace of lead formate, very slight washing removes it, inasmuch as the formate is soluble to the extent of about 1 part in 40 of water, whilst PbI_2 is practically insoluble in cold water.

The following, taken from my laboratory note-book, will show the results of actual working:—

96 grams iodine were heated in a water-bath, at 68°C ., with alcohol, potassium carbonate, and water, until all action ceased; solution filtered, the iodoform washed and dried; weight = 15 grams. Now, 15 grams iodoform contain 14.5 grams iodine; therefore, leaving 81.5 grams iodine in filtrate. H_2S passed through solution to excess, filtered, neutralized with nitric acid, and finally lead nitrate added, the resulting precipitate washed and dried; weight = 146.0 grams. Theoretically, the 81.5 grams iodine should yield 148.0 grams very nearly, so that the difference, viz., 2.0 grams lead iodide, which contain 1.1 grams iodine, represents the loss of iodine. Working on a small scale, the loss of iodine, therefore, barely exceeds 1 per cent., and, doubtless, working with larger quantities, a proportionately less percentage of loss would be realized.

The product obtained (PbI_2) is one of common use in pharmacy.

Rother, in the paper above referred to, states that "the most satisfactory results are obtained by the use of wood spirit. In this case the yield of iodoform, at each operation, exceeds one third the weight of iodine used." "An exceedingly irritating gas (to the eyes) is simultaneously evolved." I am unable to corroborate this statement. I have observed that different samples of methylic alcohol yield very varying amounts of iodoform. I doubt very much if *pure* methylic alcohol yields any iodoform whatever. The product obtained by operating upon commercial methylic alcohol is, in all probability, derived from acetone or some analogous body, invariably present in the wood spirit. The gas evolved may be methylic aldehyde, which, of course, would very speedily absorb oxygen to form formic acid. At the present moment, however, I am unable to speak with certainty. I propose, therefore, at some fitting opportunity, to operate upon *pure* methylic alcohol obtained from methyl oxalate, and thus set at rest the question whether or not methylic alcohol yields iodoform.

A vote of thanks having been passed to Mr. Smith,

The PRESIDENT said: There are not many pharmacists who, like Mr. Smith, will take the trouble to make iodoform, a thing not very frequently used, or required in large quantities; but I know that he makes a point of making everything that can be made with any advantage, and I wish his example were more frequently followed.

Mr. STANFORD: May I ask Dr. Attfield to read again the portion which refers to the precipitation of iodine by charcoal?

Professor ATTFIELD, having re-read a passage from the paper, said:

The charcoal simply takes away the oxygen from the iodate. I have never found any difficulty in obtaining iodine itself from such a residue, not only by merely adding a little nitric acid, as recommended by Mr. Smith, and then iodide of lead, but by continuing the addition of nitric acid; hydriodic acid is set free, and then on gently warming the mixture the nitric acid attacks the hydriodic acid, and you get free iodine, which you can collect and wash. With regard to methylic alcohol, there is one very good method, I think, of obtaining it, that is, by treating common wood spirit with chloride of calcium, evaporating to dryness, and pretty strongly heating the residue—not enough to char the compound, but to get rid of any volatile matters; then adding water, which decomposes the crystalline compound of chloride of calcium with methylic alcohol which is formed, and distillation gives you methylic alcohol, which one or two fractional rectifications will render nearly pure.

Mr. WILLIAMS: Some of Mr. Smith's results do not quite accord with my experience, because, in making iodoform, there is, no doubt, a large quantity of volatile compounds of iodine—iodide of ethyl, for instance—always produced; and a considerable loss of iodine, much larger than Mr. Smith speaks of, occurs from the volatilization of this organic compound. I do not think it would be possible to carry on the process with a loss of only 1 per cent. of the iodine used, for I have never succeeded in doing it without a loss of nearly 10 to 15 per cent.

Professor ATTFIELD: Mr. Smith would probably condense the volatile compounds in his long tubes, though something would depend on their length.

Mr. STANFORD: When Professor Attfield first read the paper, I thought allusion was made to a method of precipitating iodine by charcoal, but I find that is not the case. I asked the question because the affinity of charcoal for iodine is so remarkable. It has been one of the greatest difficulties I have met with, in making seaweed into charcoal instead of kelp; we can produce about three times the amount of iodine obtained in the ordinary way, but there is an extreme difficulty in washing the charcoal; in fact, washing the iodine from the charcoal on a large scale is really impossible. We are obliged always to use caustic soda for the purpose. As an iodine manufacturer, I must say I feel bound to discourage as far as possible any method of saving iodine, for what we want is some new method of securing a better outlet for it. I should like to add that none of these processes which have been constantly brought forward for the manufacture of iodine have ever been successful in

the manufacturer's hands. The old process of distillation with manganese and sulphuric acid is still followed, just as it was twenty years ago, though the form of the apparatus is a little altered. The reason of this is that none of the new processes will produce iodine in a dry commercial state; whilst the old method of employing a large quantity of oil of vitriol enables the iodine to be got at once in a perfectly dry form, and fit for the market.

SYRUPS CONTAINING PHOSPHORIC ACID.

BY SILAS DANIEL.

The difficulty of preparing chemical food according to the formula published in Parrish's "Practical Pharmacy" is well known. The phosphate of lime is only partly soluble; the strict operator is puzzled to know how much the syrup should measure when completed. He probably thinks that he has solved the difficulty when he finds in the description of the syrup that each teaspoonful contains *about* 1 gr. phosphate of iron, and $2\frac{1}{2}$ grs. phosphate of lime. Beginning with the lime phosphate, he finds that to agree with the description, the syrup should measure 36 fluid ounces. Attempting to check these figures, he calculates the quantity of ferrous phosphate produced—supposing all the iron to be utilized, which, as will be shown, is not the case—he finds that if he makes 36 fl. ozs. of syrup, each fl. drachm will only contain $\cdot 894$ of a grain of phosphate of iron. As is now shown in recent works on elementary chemistry, when phosphate of soda and sulphate of iron are mixed together, sulphuric acid is liberated, $2\text{Na}_2\text{HPO}_4 + 3\text{FeSO}_4 = \text{Fe}_3\text{P}_2\text{O}_8 + 2\text{Na}_2\text{SO}_4 + \text{H}_2\text{SO}_4$, which would dissolve a portion of the newly formed phosphate.

Again, can a syrup be made to contain 40 ozs. (apothecaries') of sugar, besides several kinds of phosphates and acids, and be limited to 36 fl. ozs., and have all its constituents in solution? It is palpably impossible. Neither is the difficulty removed by using phosphate of lime, made by double decomposition from chloride of calcium and phosphate of soda, and a smaller quantity of sugar. The phosphate readily dissolves in the acid, forming a strong solution; but immediately sugar or syrup is added, in spite of a liberal use of hydrochloric acid, a gelatinous precipitate is the result.

An elegant syrup, of definite composition, and which keeps fairly well, may be made by using tribasic acid. The method I adopt is as follows:—

Syr. Ferri. Phosph. Co.

Sulphate of Iron	671 grains.
Phosphate of Soda	2503 "
Acetate of Soda	222 "
Chloride of Calcium	585 "
Carbonate of Soda	40 "
Carbonate of Potash	60 "
Cochineal	120 "
Phosphoric Acid, syrupy, sp. gr. 1·5 .	30 fl. drachms.
Sugar	24 ounces.
Orange-flower Water	1 "
Distilled Water	q. s.

Dissolve the sulphate of iron in 3 ozs. and the acetate and 600 grains of the phosphate soda in 8 ozs. warm distilled water. When quite cold, mix the two solutions; and, after careful stirring, wash the precipitate, by means of decantation, with distilled water, and collect on a filter. Dissolve the chloride of calcium in 1 oz., and the remainder of the phosphate in 17 ozs. warm distilled water. When cold mix the two solutions, wash by decantation, and collect on a calico filter. After draining submit the precipitate to strong pressure. Dissolve the two precipitates in the acid. To the solution add the carbonates, which should first be rubbed down in a mortar with a few drops of distilled water.

The cochineal having been reduced to a very fine powder, is mixed with the sugar and 13 ozs. of distilled water, and the whole raised to the boiling point. Strain through flannel, and when quite cold add the orange-flower water, the solution of phosphates, and distilled water, if necessary, to make 36 fluid ounces.

By boiling the sugar and cochineal a bright syrup of rich colour is produced. It contains 1 gr. phosphate of iron, $2\frac{1}{2}$ grs. phosphate of lime, and fractions of grains of phosphates of soda and potash, and acid equal to about 35 min. Acid. Phos. Dil., B.P., in each fluid drachm. Sp. gr. 1·308.

The difficulty of keeping unchanged syrup of phosphate of iron, B.P., for any length of time has been recognized by all. Several chemists have at various times made experiments with a view of preventing this change, but to the present time no satisfactory result has been ascertained. Recognizing this, Mr. Carteighe, some time ago,* in order that this, and other allied syrups might be made with greater facility, at shorter intervals, published formulæ for shorter processes in which phosphoric acid, sp. gr. 1·5, is

* *Pharmaceutical Journal*, 3rd series, i., 761.

used, instead of the ordinary dilute acid of the Pharmacopœia. As the phosphates to be used in these processes were only to be a few days old, and would practically have to be made purposely, it is very questionable whether the processes would be shorter than the B.P. method. More recently, two writers have proposed a liquor ferri phosphatis to be mixed with the syrup when required. It has been stated that the solution keeps for an indefinite length of time. It becomes interesting to know whether it is as stable as has been claimed for it. In the early part of last December I prepared solutions of phosphates of iron, iron and manganese, iron and lime, and manganese. Bottles were filled with the solutions, and placed in a dark cupboard. In June last, six months after having been made, no change was perceptible. Being out of the syrup I had to open the bottle and use some of the liq. ferri phosph. Since that time a slight but distinct deposit has taken place, whilst the colour has remained unchanged. The latter fact seems to confirm the conclusions of the President of the Conference, that the dark colour is due to the production of caramel by the action of the phosphoric acid and the iron salt upon the sugar.* The brown tinge noticeable in all the solutions containing ferrous phosphate is the same as when first prepared, and is probably due to the partial oxidation of the salt during washing. It is not discernible when mixed with syrup. Considering the length of time the solution has been made, the amount of deposit is very small, and consequently the solution is an excellent method of preserving the salt.

In the following formulæ the proportions of phosphoric acid and phosphates correspond to those given by Mr. Carteighe:—

Liq. Ferri. Phosphatis.

Sulphate of Iron	224 grains.
Phosphate of Soda	200 „
Acetate of Soda	74 „
Phosphoric Acid, sp. gr. 1.5 :	7 fluid drachms.
Distilled Water	q. s.

Dissolve the sulphate of iron in 1 oz., and the phosphate and acetate of soda in $2\frac{1}{2}$ ozs. of warm distilled water. When quite cold, mix and well stir the two solutions, allow to remain for a few minutes, and then wash the precipitate, by means of decantation, with distilled water. Collect the precipitate on a filter and allow to drain. Lastly, add it to the phosphoric acid, and make up, with

* *Pharmaceutical Journal*, 2nd series, xi., 138.

distilled water, to 2 fluid ounces. One fl. drachm is equivalent to 6 fl. drachms of syrup.

The tediousness of washing the precipitate as ordered in the B.P. is well known. I have not been able to find, but I have some recollection of a paper by Mr. Groves, suggesting, in order to obviate the difficulty, that after mixing the two solutions, the whole should be boiled for a few minutes, using one-fifth more of each ingredient to make up for the phosphate of iron dissolved in the process. The method appears to me unreliable and unnecessary. Would the quantity of phosphate dissolved be always the same? In the process I have given, the salts are dissolved in just sufficient water to yield nearly saturated solutions at a temperature of 60° F. Warm water is given merely to facilitate the dissolving. In this way the phosphate sinks rapidly, and is easily washed by decantation.

Liq. Ferri et Mang. Phosph.

Ferri Sulph.	168 grains.
Manganesii Sulph.	113 "
Sodæ Phos.	247 "
„ Acet.	93 "
Aquæ Destillatæ	q. s.
Acid. Phos. Glacial	5vj.

Dissolve 150 grains phosphate and 56 grains acetate of soda in 2 ozs., and the sulphate iron in 6 drachms of warm distilled water, and allow to cool. Wash and collect the precipitate as directed in the last. Dissolve the sulphate of manganese in 6 drachms, and the remainder of the phosphate and acetate of soda in 10 drachms of warm distilled water. Mix the two solutions. Wash and collect the precipitate as the preceding ones. Add the glacial acid to the two moist precipitates, and when dissolved filter and add distilled water to 2 fluid ounces; 1 fluid drachm is equivalent to 6 fluid drachms of syrup. The syrup when made will contain $\frac{3}{4}$ grain phosphate of iron and $\frac{1}{2}$ grain phosphate of manganese in each fluid drachm.

Glacial acid has been used in this preparation, as directed in the *Pharmaceutical Journal*, 3rd series, i., 288. It has kept admirably.

Liq. Ferri et Calcis Phosph.

Sulphate of Iron	224 grains.
Phosphate of Soda	200 "
Acetate of Soda	74 "
Phosphate of Soda	508 "
Chloride of Calcium	156 "
Phosphoric Acid, sp. gr. 1.5	8 fl. drachms.

The ferrous phosphate having been prepared as before directed, dissolve the remaining phosphate of soda in 5 ounces, and the chloride of calcium in 3 drachms, of warm distilled water. When cold, mix the two solutions, stir, and wash. Collect the precipitate on a calico filter; after draining, press it firmly until the weight of the moist phosphate is reduced to 6 drachms. Dissolve the two precipitates in the acid, and add distilled water, if necessary, to make 2 fluid ounces. One fluid drachm is equivalent to 6 fluid drachms of syrup, which when made, will contain 1 grain of phosphate of iron and 2 grains of phosphate of lime in each fluid drachm.

Liq. Ferri et Strychniæ Phosph.

Sulphate of Iron	448 grains.
Phosphate of Soda	400 "
Acetate of Soda	148 "
Phosphoric Acid, sp. gr. 1.5	10 fl. drachms.
Strychnia in crystals	3 grains.
Distilled Water	q. s.

Dissolve the sulphate of iron in 2 ounces, and the acetate and phosphate in 5 ounces, warm distilled water. Wash, and collect on a calico filter. After draining, press out some of the remaining water. Dissolve the precipitate and the strychnia in the acid, and add distilled water, if necessary, to 2 fluid ounces. One fluid drachm diluted to 6 drachms with simple syrup will contain in each fluid drachm 2 grains phosphate of iron and $\frac{1}{32}$ of a grain of strychnia.

Liq. Ferri et Quinæ Phosph.

Sulphate of Iron	448 grains.
Phosphate of Soda	400 "
Acetate of Soda	148 "
Phosphate of Quinine	96 "
Distilled Water	q. s.
Phosphoric Acid, sp. gr. 1.5	9 fl. drachms.

Prepare the ferrous phosphate in the same manner as directed for liq. ferri et strychniæ phosph. and dissolve it in the acid, and make up with water to 2 fluid ounces. The phosphate of quinine is best added when required.

Syr. Ferri et Quinæ et Strychniæ Phosph.

As has been pointed out, this preparation, neither in solution nor in syrup, will keep without becoming discoloured. It may be made by adding 6 grs. phosphate of quinine to each fluid drachm of the liquor, or 1 gr. to each fluid drachm of the syr. ferri et strychniæ phosph.

Liq. Zinci Phosph.

Most chemists keep phosphate of zinc, and, as its solubility is not impaired by keeping, it is best made direct in the manner directed by Mr. Carteighe.

Liq. Manganesii Phosph.

Sulphate of Manganese	226 grains.
Phosphate of Soda	194 „
Acetate of Soda	74 „
Phosphoric Acid (1·5)	7 fl. drachms.
Distilled Water	q. s.

Dissolve the sulphate of manganese in 1 ounce, and the phosphate and acetate of soda in $2\frac{1}{2}$ ounces, of warm distilled water. Mix the two solutions. Wash by decantation. Collect on a fine calico filter, and, after draining, press out a portion of the remaining water. Dissolve the precipitate in the acid, and add distilled water, if necessary, to 2 fluid ounces.

One part made up to six with simple syrup will contain in each fluid drachm 1 grain of phosphate of manganese.

The PRESIDENT: Mr. Daniel's formulæ seem to be well thought out and well worked out, and perhaps will be useful to many of us. These syrups are often ordered, and what we want is a rapid mode of making them. The great obstacle to rapidity is the difficulty of washing the precipitate, and I prefer mixing the solutions hot, and boiling them. I find that, if instead of using acetate of soda I use carbonate, I get a better result. I mix the phosphate of soda and sulphate of iron, and boil them rapidly; I get of course a precipitate, and a certain amount of phosphate dissolved. Then I put in carbonate of soda as long as effervescence ensues, and I get thrown down a granular precipitate, which is very easily washed. In this way I have been enabled to make syrup of phosphate of iron in about an hour. Omitting acetate of soda does not entirely prevent coloration, though it does so to some extent. I know some have said that the coloration of the syrup of phosphate of iron is due to the formation of peracetate of iron; but that is not so, because syrup made without acetate also colours, though it takes a longer time. I have now to ask you to pass a vote of thanks to Mr. Daniel.

The vote of thanks was passed unanimously.

Mr. EKIN: I have found that the acid solution of the precipitated phosphates will keep for years without the sugar, and the way I manage is to keep a quantity of that, and make the syrup in small quantities as it is wanted.

Mr. UMNEY: I can quite corroborate what Mr. Ekin has said, for I have for years made a solution of phosphate of iron which I have found to keep very well. There can be no question that the use of dilute phosphoric acid in pharmacy for the manufacture of these syrups will eventually be abandoned, and that the precipitated ferrous phosphate will be dissolved in a concentrated phosphoric acid (1.500 specific gravity, containing about 49 per cent. of anhydrous acid, answers excellently). Such a solution will keep perfectly well, and may be added to the simple syrup when required. I have made a solution eight times the strength of the Pharmacopœia, which can be diluted when required by the addition of simple syrup, and in this way one can get a preparation equal, if not superior, to that of the Pharmacopœia.

Mr. SMITH: I should like to ask these gentlemen if they do not find a small deposit at the bottom of the bottles of the acid solution. I have made the solution with strong phosphoric acid, and have sometimes found there has been a deposit.

Mr. EKIN: I did not use the strong phosphoric acid, but the dilute acid of the Pharmacopœia, and proceeded precisely the same as the Pharmacopœia orders. The solution thus made keeps, to my knowledge, for three or four years without the slightest change.

Mr. GILES: I should like to ask a question about the precipitation, which the writer seems to think the most tedious part of the process. The phosphate of iron, when first thrown out of solution, appears to subside very tardily, but after it has subsided, and you have decanted one lot, and added water, it precipitates very rapidly, so that you can speedily throw it on a calico filter and squeeze it dry. Finding the first subsidence is so tedious, it occurred to me, that perhaps if more water were used in the first place it would subside more quickly.

The PRESIDENT: Perhaps the hydrated phosphate breaks up, and loses its water of hydration.

Professor ATTFIELD then read the following paper by Hr. Heathfield:—

NOTES ON EXTRACTS OF ACONITE, BELLADONNA,
HEMLOCK, HENBANE, AND COLCHICUM.

By W. E. HEATHFIELD, F.R.S.E., F.C.S.

Among the suggested questions and subjects for research in the list issued by the executive committee of the British Pharmaceutical

Conference occurs the following:—"In preparing extracts of aconite, belladonna, hemlock, henbane, and colchicum, should the starch and chlorophyll of the plants be rejected or retained?"

The consideration of this question requires that a distinction should be made between the first four of this group and the last, for whereas in the former the fresh expressed juice contains the starch, albumen, and chlorophyll in a condition of assimilation, in the latter the starch separates at once from the cold liquor, and can be washed so as to leave it tasteless. Thus it is presumable that, in preparing the extract of colchicum, we may be allowed to separate the fecal part in its natural state, before we deal with the clear expressed juice. Those excellent preparations introduced by the late Mr. Edward Bentley, under the name of expressed juices, and of which the late Dr. Pereira had so high an opinion, save that the large quantity of liquid along with them made them less facile in administration, are good examples of the value of processes undisturbed by heat, where heat, as in the case of these extracts, produces a decomposition. As we do not know, from a hygienic point of view, the exact part that the chlorophyll and albumenoid substances act in the economy of the medicine, so should we be careful in dealing with separations necessarily accompanying the somewhat rude operations of inspissation. Dr. Pereira was of opinion that the albumen of conium juice, when coagulated, retains a portion of the active principle, mechanically or chemically combined. And the balance of affinities is so much upset by the action of heat that if one element is to be rejected, it is difficult to tell where to cease. The chlorophyll separated, the albumen removed, the large proportion of chlorides freed, as it were, from their shackles, and no longer able to do their duty as solvents, the nature of the medicine has undergone so great a change that it is scarcely recognizable. If we are dependent in extract of aconite on aconitia, in that of belladonna on atropia, in hemlock on conia, and in henbane on hyoscyamia, we are leaning on a broken reed; and in the able paper of your President on "The Assay of the Alkaloids in Medicinal Extracts," he has pointed out the unreliability of certain processes in reference to it, and I am not aware that any success has resulted from efforts to procure these alkaloids from pharmaceutical extracts. From four ounces of extract of conium, representing about five pounds of the fresh herb, prepared by one of the most respectable makers in London, Dr. Pereira was unable to obtain any sensible quantity of conia, and both Geiger and Dr. Christison have offered their opinion that this extract contains very little conia,

Thus we may reason that there may be a medicinal quality so looped up in, and intermingled with, the juice of the plant, that in rejecting what seems superfluous, we may be losing a valuable ingredient. That the well-known liq. cinchonæ cordifoliæ, as prepared by the late Mr. Battley (and which has been imitated at so humble a distance in the extractum chinchonæ flavæ liquidum of the Pharmacopœia), wherein most of the constituents of the bark were retained, could be taken by a patient with benefit when quinine produced headache, would indicate, as the sagacious introducer of this preparation suggested, that the natural condition, or as near to it as we can sail, is the proper one. And he held a similar opinion with regard to the narcotic juices. In an experiment with 84 lbs. of carefully plucked hemlock leaves, yielding about six gallons of juice, which was subjected to a temperature of little more than 100°, the collected chlorophyll amounted, when dried, to 5 oz. 1 dr. 36 grs. This was subjected to the action of spirit of wine, 56 over-proof, which yielded, on evaporation, 1 oz. 4 drs. 30 grs., having a highly resinoid character, of a beautiful green colour, and smelling very powerfully of the fresh herb. The six gallons of juice were then distilled; the first gallon was powerful of hemlock, and had a little oily substance on the surface. The remainder of the distilled liquid had but little flavour, and the final extract, being 1½ lbs., had little smell or taste of conium. The heat it had been subjected to during the distillation had much injured the extract.

The observations I have now made in allusion to hemlock, are much in accordance with those referable to other narcotics in the green state; and when we consider how small a quantity of their alkaloids seems to exist in the completed extracts, we are, perhaps, entitled to look further for their efficacy. That the aconitia of aconite resides in the root, and the conia of hemlock chiefly in the fruit, has been pointed out by distinguished explorers in this field. From 6 lbs. of fresh, and 9 oz. of dried fruit of hemlock, about 1 oz. of conia was obtained by Geiger, whereas from 100 lbs. of the fresh herb, corresponding to 3½ or 4 lbs. of extract, he got but one drachm. Nor could he get traces in the dried leaves, though from 9 oz. of the fruit which had been preserved not very carefully for about sixteen years, he procured 1 drachm. Dr. Christison produced from 40 lbs. of ripe but green seeds, 2½ oz. of hydrated conia. Mr. Stoddart has pointed out the percentage of hyoscyamia in the seeds as 3 per cent., but in that of the dried leaves but .73 per cent. When we take into account the very small proportion of these alkaloids in the parts officinal which are ordered for extract, and further recognize the

waste or decomposition they undergo when under the influence of the process, we should hesitate to select the chlorophyll and albumen or starch as victims, until we have established a more accurate discernment of their use and value.

In allusion to colchicum root, I may state that 42 lbs. of the fresh root having been expressed, there was a yield from the cold juice of $2\frac{1}{2}$ lbs. of well-edulcorated starch, the remaining supernatant liquor producing, on evaporation, about $1\frac{1}{2}$ lb. of extract.

The PRESIDENT: You have heard Mr. Heathfield's paper, and I have no doubt you will accord him a vote of thanks. In one part of his paper he mentions the suggestion of Dr. Pereira, whether the active principle of conium might not be diminished or removed by coagulation, the alkaloid separating in combination with albumen. Now quite recently a French chemist has been examining that very question, and he proves that there is a definite series of combinations between albumen and the alkaloids. He has described his process, and given his formulæ; and there is no doubt about it, I think, that if we make a green infusion, boil and filter it, the coagulum will contain a notable quantity of alkaloid.

A vote of thanks to the author was passed unanimously.

Mr. SCHACHT: I feel that I owe an apology to the members of the Conference, inasmuch as, by some mistake of my own, my name has been published in the earlier editions of the programme as the contributor of a paper. The mistake arose from the fact that when the President asked me if I should be able to produce anything for this meeting, I told him I was working on a matter which might produce some results worthy of being brought before the Conference, on the subject of the succus and extract of conium. I may now say in what direction I have been working, rather than give the results, which at present are rather imperfect. The idea was suggested to me at the last year's Conference, when Mr. Ekin gave us some experiments on the hydration of extracts; and it occurred to me that that kind of investigation would have been a little more valuable if he had been able to answer a question which I put, whether he thought anything but water had passed off during the inspissation. He replied that he had not investigated the matter, and I thought I would attempt to do so. In taking the special subject of conium, I thought the succus would be more satisfactory to work upon than the extract, because one finds opinions go generally in the direction of estimating the succus as being the

more valuable medicinal material, and I thought it would be interesting to ascertain, if possible, whether in the process of the reduction of the juice of the plant to the condition of the extract, a very large proportion of the nitrogenous matters were parted with that originally existed in the succus. I spoke of the matter to Mr. Siebold, and I do not think it is quite fair that I should assume the idea as original, for I almost think that in conversation he suggested to me the desirability of adopting the process of estimating it by the plan lately adopted for estimating nitrogenous matters in potable water, using those fine measurements which we are able to employ by the process of Nesslerizing. Conium does not come to maturity until somewhat late in the season, and consequently my time has been rather short, and my results have as yet been imperfect. I have tried to satisfy myself of the exact quantity of nitrogenous matter of all sorts, volatile and non-volatile, which existed in a certain specimen of succus, and then I thought, by bringing the same sample into the condition of an extract, one could estimate the proportion of nitrogen then present by a similar process, and satisfy oneself if any large amount had been driven off. I have got through one-half of my task, and have satisfied myself pretty well of the percentage of nitrogen which the succus contains. I have begun the other part of the work, and have gone so far that I feel quite sure it is considerably less, though I cannot yet venture to say the proportion which the extract bears to the succus, and I am not quite sure that the conclusions one would draw from such comparison would be very valuable. The difficulty is increased by the fact, given on the authority of Mr. Wanklyn, that all nitrogenous alkaloids do not equally yield their nitrogen to this process. I dare say, gentlemen, you are aware of the curious page in his book, in which he gives us two lists, with the statement that a certain portion of the alkaloids yield all their nitrogen to this process, but that those in the other list yield only half. That is a very remarkable statement, and one which would not be accepted but on the very highest authority; possibly some gentleman here may be able to confirm it, and if it be so, one would have to ascertain, in the first place, whether the active principles of conium are to be included in the one list or in the other, in order to estimate with anything like accuracy the possibility of the difference in nitrogen being explainable by the passing off of the active principle of conium, conia. I hope at some future time to be able to indicate the results of my experience; in the meantime, I can say that, as far as I can make out, the average quantity of ammonia obtained from the succus

conii is .1776 per cent., corresponding to .1460 per cent. of nitrogen.

Mr. EKIN: When I suggested last year that Mr. Wanklyn's mode of limited oxidation might be applied to the estimation of the alkaloids in vegetable extracts, I said I meant to work further on the subject. I cannot say that I have yet done so, though I have thought a great deal about it, and furnished myself with all the information I could obtain. I find, however, that the whole subject is in such a fog, that so little is known of the proteid constituents of plant juices, that I am not very sanguine that anything can be done in this direction. Even if it were possible to separate and remove all the vegetable albumen present in the plant juices or extract, there might, and probably would, still remain other vegetable proteids, and which would also yield ammonia. It would be necessary to get rid of these before one could say with certainty that the amount of ammonia yielded by a vegetable extract was due to any alkaloid it might contain. It seems impossible to do this. Also in the case of conium it would be necessary, in the first place, to know the proportion of its nitrogen which conia yields as ammonia when treated with an alkaline solution of potassium permanganate, and one great difficulty would be to get the pure alkaloid, to start with, to ascertain this. I am not sure whether the pure alkaloid can be obtained at all. Therefore I almost despair of any result being arrived at in our present state of knowledge.

Mr. SCHACHT: My object would be to endeavour to ascertain whether there was any difference in the yield of the fresh juice and in the extract; if so, you would then be pretty clear that you had parted in the process with certain volatile organic matters.

Mr. EKIN: That is just the point. I do not see how you can be clear that you are parting with the volatile constituents. I think the only way, as you suggested to me some time ago, Mr. President, would be to try and find some precipitant of the alkaloids.

The PRESIDENT: As I understand Mr. Schacht, he takes two ounces of the juice of the plant, evaporates one to an extract, allows the other to remain in its natural state, and compares the two by Nessler's process.

Mr. STODDART: I must say I think Mr. Schacht's idea is rather a good one. We know the peculiar mouse-like smell of conium, which the extract does not possess. I think it is not to be disputed, therefore, that ammonia is given off in some way or other; and this seems to me to be a very good way of answering the question, whether ammonia is given off in making the extract.

Mr. SCHACHT: I look upon it in this way—that the succus conii as freshly expressed would, of course, contain a certain mass of nitrogenous material. A portion of that would, of course, be albuminous, which would probably be non-volatile, and a portion of it probably would be conia. I suppose there is such a thing, and probably there might be other active materials, which would be volatile possibly, or possibly not. I should estimate the whole of the nitrogen by a percentage process. If, after evaporating a portion of the juice to the consistence of an extract, I found that it yielded a certain lessened amount of nitrogen, I should infer that a portion of the nitrogen did really exist as a volatile organic base, and that it had passed off in the process of reduction to an extract. I quite admit that it would be a further question in what form that volatile organic matter had passed off, and that would be a more difficult question to answer than I had proposed to myself at present.

Mr. WILLIAMS: You must bear in mind that the bases do not exist in vegetables as such. The principle does not exist as conia until an alkali is added, when it is developed; and I should very much doubt if the salt of conia would be volatile, as you seem to think.

Mr. SCHACHT: That is the question I want to solve.

Mr. CATFORD: A few weeks ago I exhausted a residue of succus by distilling it in the usual way with water, supersaturated with acid, evaporating and distilling with caustic alkali, and I prepared about half a drachm of conia from the mass supposed to be exhausted. I should like to know whether the conia does all go out with the succus, or whether it may not exist in the solid form crystallized in the cells of the plant, and so require further treatment than mere mechanical expression. The sample was unfortunately lost, or I would have brought it.

Mr. UMNEY: I think Dr. Harley's experiments have quite set at rest any doubt we might have had as to the value of succus conii. Speaking from memory, I believe that gentleman experimented on himself, and took succus conii to the amount of ten or eleven drachms per day, until it had such an effect upon his legs that he could scarcely lift them. I have found since his paper was published that the consumption of extract of conium has been getting less and less every year, and that succus conii has been gaining in favour. The president has referred to the experiment of a French chemist, showing a combination of albumen with alkaloids. It seems to me that a considerable quantity of albumen would be pre-

cipitated by the addition of the alcohol ordered in the B.P. process; Mr. Schacht therefore, I would suggest, must not lose sight of this point in continuing his experiments.

The PRESIDENT: I think the combination referred to was of the labumen coagulated by heat, which is not the same thing.

The next paper read was—

NOTES UPON CHINESE PHARMACY IN HONG KONG.

BY ARTHUR HUNT.

From the unpretending character of the establishments wherein the various articles of Chinese materia medica are stored and dispensed, European foot passengers would ordinarily pass them by. They have no bright coloured show bottles in their windows (in fact their windows as a rule are quite guiltless of glazing), no attractive placards, none of the multitude of curious, pretty, and well-arranged articles which in England go to make up the usual well-known chemist's window; neither have they the familiar odour which greets us here as we pass the door. But the not unfrequent music of the pestle and mortar attracts the attention, and appears to invite a brother chip to enter. Before leaving the mixed crowd of odorous Chinese, if at sundown, the observer would be struck by the little brightly smouldering joss-sticks, placed on a sort of altar in a small niche generally built exposed to the street on one side of the doorway. This sort of service to their good fortune the Chinese seldom if ever neglect. Perhaps it would be interesting to mention how the little joss or god sticks are manufactured. They are about ten inches long and about half the thickness of an ordinary tobacco-pipe stem, and for one-third their length have been rolled in a composition of well-kneaded cow's-dung and sandal-wood powder; when finished and dried, they resemble bullrushes in miniature, although not so dark. If lighted at the upper end, the composition continues to glow until it is all consumed, giving off a not unpleasant smoke, and leaving a whitish grey ash. The manufacture of these and others of various sizes gives employment to a great number of persons.

The internal arrangements of a Chinese pharmacy are very much as we might expect: a counter runs frequently on either side the store, as it does with us. An assortment of cheap, dark-glazed, and sometimes curiously shaped jars serves to keep a variety of messes in, some of which, of a dark colour, and apparently unfathomable

nature, greatly offend the European by their abominable odour. A set of some two dozen drawers answers the purpose of keeping the retail and dispensing stock of cut and dried roots, herbs, etc. A few bottles may also be noticed, but no formidable show is made of them.

Passing by the retail counter, with its dreamy assistants, towards the little sanctum in the rear, one may catch a glimpse of the style in which the business is conducted. Here is one pig-tailed, almond-eyed individual, with shaven crown, dressed in blue, busy at the books. He holds his brush-like pen not in a sloping but perfectly perpendicular manner, and ever and anon smears the point of his pen with ink from a small wet ink palette (in other words, takes a fresh dip). The ink is solid, and is known here by the name of Indian ink; it lies near at hand, and to replenish his inkstand he merely rubs the ink stick a few times upon the ink palette moistened with a little water. Here is another cutting up roots; he slices them beautifully, for the Chinese are proverbially skilful at this branch of the pharmacist's art. When the required quantity is obtained, he places it upon a very shallow bamboo sieve, or drying tray, and adjourning to the back yard, or the top of the house, or the front street, exposes the slices to the heat of the sun, in some instances very cleverly and patiently tossing them about until sufficiently dried. A third, probably the dispensing assistant—the major associate—is conning a prescription, which is a curious and somewhat imposing looking document, written in the vernacular upon a thin dirty-looking piece of paper. Having made himself master of its contents, he proceeds to dispense it. He places upon the counter a piece of coarse paper, and weighs in order, with his steelyard-like scales, the various drugs mentioned in the prescription; and on the weighing of the usual eight or twelve ingredients being completed, all the drugs are wrapped in one parcel, tied up with twisted paper or grass, and the direction either written upon the parcel or verbally given to the patient,—the latter on account of the inability of Chinese females to write or read. The majority of the prescriptions order only vegetable drugs, and very frequently the dispenser most carefully and neatly wraps each individual drug in separate papers, which in some cases are differently coloured. The scales above-mentioned have only one pan and one sliding weight, the graduated rod or beam serving to mark very accurately the desired quantity; being, in fact, as near as possible like our own steelyards. The observer in a Chinese pharmacy would readily notice the entire absence of those neatly labelled and

capped bottles of medicine, in all stages of their preparation, which is so characteristic of our own pharmacies.

The Chinese pharmacist, in common with nearly all traders, takes apprentices, who are bound for several years; they in turn taking their position as assistants or masters as circumstances permit.

Going farther, we reach a small room partitioned off from the shop by scroll or lattice-work, gaudily gilded and somewhat artistically decorated with gaping-mouthed dragons. In this little space of four or five feet square (a consulting room, in fact, which is always attached to a Chinese pharmacy), we may observe a blue-habited, venerable bearded man. By the way, I am informed that the Chinese do not consider themselves entitled to wear the beard until they are grandfathers; which I am inclined to think is a polite way of saying they could not grow a respectable beard at an early period of their lives. The doctor sits by the side of a dark wood table with marble top, upon which a soft cushion is placed: this serves as a rest for the wrist of the small-footed lady who is seated opposite to him. The elderly celestial is intent upon her pulse: he continues his observations for several minutes, chatting every now and then. Having made his diagnosis, which he does almost entirely by the pulse, he writes a prescription, and it is handed to the dispenser; the result is, the lady leaves the establishment with a parcel of drugs, such as described above, to infuse or boil.

In the Chinese pharmacies may be found very many carefully dried herbs, roots, etc. Rhubarb, which they call "wong tai" or great yellow, and liquorice root appear to be decided favourites in their prescriptions. Also the ginseng root, turmeric, salep, oubebs, camphor, Chinese cinnamon, coriander, fennel, assafoetida, yellow dog fern roots, and sea-horses, with many other bitter, astringent, laxative, and mucilaginous substances. Alum is largely used in one form or another. Lime, which they principally obtain from shells, is used by them in combination with other things as an outward application. Small pearls, when very finely powdered, are looked upon as very precious for their healing properties. The sea-horses mentioned above are very numerous in the China Sea, and are esteemed as a remedy in debility and consumption. When caught they are pickled in salt and water until they become black, and when wanted are boiled, and the decoction reserved for use. The head of this singularly shaped fish greatly resembles that of a horse; they are from four to eight inches long, and two or three good specimens may be seen in the Crystal Palace Aquarium. Sandal-

wood, which is very extensively used as incense, and for the manufacture of carved and other ornamental boxes, is called by them "tarn heong," the oil from it "tarn heong yow." This oil has some considerable reputation among them for its efficacy in restraining mucous discharges. Oil of peppermint called "pok hoo yow," and peppermint camphor called "pok hoo ping," are both used extensively, the former most so. The latter is a curious substance which separates from oil of peppermint under certain conditions. It is white, floats on water, is nearly transparent, and has a warm peppermint and camphoraceous taste, and it occurs in small, slender pieces, somewhat resembling large crystals of sulphate of magnesium.

Although these and some other essential oils may be noticed in the druggists' shops, very many distinct places for their sale may be found, separated from the regular pharmacies. The proprietor of an essential oil shop frequently shares it with another tradesman, which is one of the many curious features of Chinese trade; two or even three distinct trades may be observed in one small shop. The oils are put up in small very thick green glass bottles, holding from ten drops to an ounce or two, and enclosed in neat, attractive little boxes, with the invariable red label. The counter bills in a Chinese essential oil shop are generally printed in blue and red characters on thin white paper; the advertisement setting forth the numerous virtues of the pok hoo yow is frequently embellished with a figure of a dragon on either side of an alembic.

Oil of peppermint is largely used and believed in by the Chinese as an outward application. In headache, for instance, a drop or two applied on either side the head, midway between the eye and ear, is said to relieve the pain. Another favourite remedy is a pitch plaster, the size of a sixpence, placed in the same position.

Besides the regular pharmacist whose establishment we have noticed, another and certainly more conspicuous (though not so numerous) set of druggists may be seen. They keep a sort of herbalist's shop, and supply many kinds of both fresh and dry herbs, roots, etc., and in some of these places a sort of herb poultice composed of bruised and chopped herbs, roots, and coarsely powdered mucilaginous seeds, may be obtained ready made. They also make to order what we should consider the most inelegant and disagreeable-looking plasters and poultices that one can conceive. Pharmacy has also its street representative in the quack, I suppose the respectable shopkeeper would call him. He carries his stock-in-trade about with him, by means of a couple of baskets or boxes,

slung one at each end of a bamboo balanced on his shoulder ; or he has a small stall, like the quacks we see in our country market-places, and I believe is licensed by the Hong Kong government as a hawker. He takes his stand under the shade of a friendly tree, a verandah, or clump of bamboos, and soon gathers an admiring crowd ; and here may be seen the most loathsome lepers and ulcer-eaten people, upon whom he has probably tried his remedies. The quack speedily puts his hearers into good humour with his own, but the cash rolls in very slowly (for the Chinese among themselves do everything very cheaply). All the money that the quack takes probably consists of the coin known as cash, each piece being worth about the tenth part of a halfpenny. The Chinese are passionately fond of gambling, and seek it at every turn of their lives ; therefore, it is not to be wondered at that they demand that the charm of gambling be added to the purchase of physic. This is very simply and quickly carried out by means of a number of strips of the never-failing bamboo, painted all one colour at one end, the other end having a few prize colours interspersed with the blanks ; the lower ends are concealed in a jar, and the gambler draws a stick. If he is fortunate, he may get the full value for his money, but the chances are much in favour of the banker.

The street hawker of medicines sometimes tries his hand, and I may say his nails (which all Chinese wear very long), at dentistry. I saw an old disciple of the above class extract a fine tooth by means of his very long thumb and finger nails. I watched the operation for at least twenty minutes, and it was described to me as elegant dentistry, and a painless extraction.

In regard to the powerful drug opium, which, by the bye, is not usually found in pharmacies, the widespread use of it among a certain class of Chinese has led the Hong Kong government to license a few retail shops, and to have them under control. These retail shops do a very brisk trade at all hours ; they are supplied with the extract by the wholesale merchants, who manufacture it on a very large scale, adopting a very simple process. All the soluble portions of East Indian opium are extracted by water : by subsidence a clear solution is obtained, which is simply, though carefully, evaporated over wood and charcoal fires, in brass pans of the capacity of three or four gallons. A series of these pans is kept fanned and stirred by several coolies. When finished, the extract presents the appearance of very thick dark-brown treacle. To smoke it, therefore, the opium-smoker takes a few grains upon his pipe or stick, and by a few dexterous turns in the flame of an oil

lamp placed upon his bed for the purpose, he has the drug dry enough to fume for his most enervating and debasing debauch.

The PRESIDENT : Papers like this tend to enliven our proceedings, and also convey some useful information, and I hope you will accord Mr. Hunt a vote of thanks.

Mr. HANBURY : There is not a great deal to be learned from the pharmacy of the Chinese, but there are one or two things they do to admiration. For instance, they appear to have some clever contrivance for slicing roots, and with their inexhaustible patience they produce a very beautiful article. Another thing I have had an opportunity of observing is the powder of substances, such as carbonate of lime, which, by the aid of elutriation, are obtained in a state of remarkable fineness.

The PRESIDENT : Mr. Hunt referred to the "odorous Chinese." I think I heard or read some time ago that they exhale an odour of musk, or something like that.

Mr. HUNT : They have a peculiar and characteristic oily smell, which it is impossible to describe.

Mr. GILES : It seems easy to believe that different races should be characterized by special odours; a more remarkable phenomenon is attested by persons connected with lunatic asylums, viz., that lunatics exhale a special and characteristic odour which is distinctly recognizable.

Mr. HUNT : Almost all the Easterns have a characteristic smell of their own. I found in travelling that if there were a number of different nationalities collected together, I could recognize a distinct odour peculiar to each.

Mr. FRAZER : I am not able to add anything to our scientific knowledge of Chinese pharmacy, but as a visitor to the British Museum I might give some information which even to some London gentlemen may be new. There is in the museum, under the charge of Mr. Carruthers, the contents of a Chinese apothecary's shop, at least 3000 or 4000 years old, and many of the roots and leaves are the very same as those now in use, and are in perfect preservation. I may add that Mr. Carruthers would be very glad if any gentleman acquainted with these things would pay him a visit, and assist him to arrange the articles.

SUGGESTIONS RESPECTING THE OFFICIAL AND OTHER CONFECTIONS.

BY T. HAFFENDEN.

Confections are very old preparations. Under the names of electuaries and conserves, this mode of preserving and presenting medicines has maintained a firm position amongst compound remedial agents.

If the confections of the present Pharmacopœia are compared with those of any previous era, I think they will show a decided advance on the crude notions that so long prevailed. Sir Walter Raleigh's confection contained shavings of hartshorn, viper's flesh with hearts and livers, flowers of borage, rosemary, marigolds, sundew and red elder, leaves of scordium, carduus benedictus, baum, cretic dittany, mint, marjoram, betony, juice of kermes, greater cardamom seeds and cubebs, of juniper berries, mace, nutmegs, cloves and saffron, cinnamon, sassafras bark, yellow peel of citron and oranges, aloes wood and sassafras wood, roots of angelica, wild valerian, fraxinella or white dittany, Virginia snake root, zedoary, tormentil, bistort, long and round birthwort, gentian and masterwort; upwards of forty ingredients. This is very far behind our confection of senna, the most complex of our modern confections. Still it is considered that confections need criticism, and I would suggest that the list might be extended.

Confectio Opii.—Is it worth while to class this among the confections? It will not keep any length of time when made. Why not relegate it to the list of powders, as the Pulv. amygd. co., formerly known as Confect. amygd.?

Confectio Piperis.—A substitute for Ward's paste. It seems a useful simple remedy.

Confectio Rosæ Caninæ; *Confectio Rosæ Gallicæ*.—These are very nice when fresh, but likely to crystallize by keeping; a great disadvantage, as they are very largely used for pill excipients. A sufficient quantity to make a mass is the way they are frequently ordered in prescriptions, the consequence being that according to the age and consistence of the conserve, so is the size of the pills. It has occurred to me whether the addition of a small portion of glycerin in the manufacture of these conserves would tend to prevent crystallization. A great deal of trouble is frequently given to the dispenser by having to incorporate "essential oils" in the masses; the pills sweat and are troublesome to coat. Would it not be worth while to

prepare conserves to take to some extent the place of essential oils in pills? As, for instance, a conserve of lavender, prepared with lavender flowers, sugar, and glycerin, would be a very elegant form of exhibiting a well-known carminative, and the most fastidious lady would not object to swallowing lavender pilules. Or a confection of orange would be a very nice form for exhibiting quinine as an electuary, and might even be mistaken for marmalade spread on bread and butter, and given to patients.

With reference to the conserves as excipients, I have not tried the qualities of a proportion of glycerin in arresting crystallization. It seems to me, if we can only manage that matter, it will be better for us, and there will not be the liability, as there is now, to make pills of various sizes in different pharmacies, according to the bias or inclination of the dispenser.

Confectio Scammonii.—This, with confection of senna, is not simple enough for the present time. I would suggest the advisability of having for this class of confections a standard *simple confection*, as a basis for incorporating the active ingredients, in the same way that we have simple ointment amongst the ointments. The composition need only to be extremely simple, the pulp of tamarinds or prunes with sugar and glycerin, if that proves of any service. Then we might have confections of jalap, scammony, senna, etc. I should imagine a nice aperient confection for children could be made of simple confection, jalap, senna, and ginger, combined.

Confectio Sennæ.—The remarks on previous confections apply to this, the more so as this is now frequently in practice made the basis of compound electuaries, containing jalap, sulphur, cream of tartar, etc.

Confectio Sulphuris.—This is a very elegant preparation when fresh made, but apt soon to become disagreeable from pellicles of sugar crystallizing on the surface. This might be advantageously made with simple confection as suggested. In this connection, however, is it wise to ignore the old family brimstone and treacle? Is it quite out of place to give this a standing among recognized formulæ? We are often applied to as to the proper strength to mix this valuable household remedy, and in practice I have found it vary from one ounce to eight ounces to the pound of treacle in different parts of the country.

Confectio Terebinthinæ.—The last of the authorised confections is, in my opinion, the best. The liquorice disguises the taste of the turpentine most effectually. Here it appears to me my proposed Conf. lavand., used instead of the honey, would still more effectually

ally disguise the smell of turpentine, and make a more elegant preparation than it is now.

In conclusion, there are one or two remedies that are found very useful in their action, which are too bulky to be taken in sufficiently large quantity in the form of pills, and yet it is very difficult to exhibit them elegantly in the form of mixtures; such as cinchona, carbonate of iron, guaiacum, etc. These, I would suggest, might be advantageously exhibited with the simple confection, and find a place in the Pharmacopœia. There is an old form containing guaiacum, called the "Chelsea Pensioner," that has been very much used; then there is no Conf. cubebæ; this is very generally in use; in our Brighton Hospital it is used very largely. We make it of powdered cubebæ, carbonate of soda, balsam copaiba, and syrup, and find it most useful. I need not reiterate the advantages of having a standard authorized formula for all well-known and largely used preparations.

A vote of thanks was accorded to Mr. Haffenden.

ON THE INFLUENCE OF THE MEANS OF SUPPLY UPON WATER USED FOR DOMESTIC PURPOSES.

BY M. M. PATTISON MUIR, F.R.S.E.

Last year I communicated to the Conference the results of certain measurements of the action of sewer gases upon water supplied for domestic purposes: from these measurements I inferred that water which comes through the ordinary dwelling-house cistern contains a considerably larger amount of nitrates than water which is supplied directly from the main pipe. As this inference was drawn from an examination of but two samples of water, I have deemed it proper to extend the investigation so as to arrive at results which may be of more general application. The samples have been so selected as to secure the examination of typical waters; some of these samples have been taken from large and well situated dwelling-houses, others from middle-class houses, while others have been supplied to me—through the kindness of the sanitary inspector of Glasgow—from houses occupied chiefly by the lower classes, and situated in the more crowded parts of the town.

The results of the examination are given in the form of a table; all the quantities being stated in *parts per million* of water, which is equal to *milligrams per litre*.

	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.	No. 10.	No. 11.	No. 12.
Free Ammonia .	·005	·085	·023	—	·015	·015	·010	·035	·015	·075	·20	·045
Albumenoid Am- monia . . . }	·092	·120	·080	·082	·090	·080	·085	·085	·070	·065	·370	·090
Nitrogen as Ni- trates & Nitrites }	·309	·463	—	·321	·360	·20	·258	—	·284	·306	·414	—

No. 1. From main pipe. No. 2. From cistern in same house; in this house the cistern water is very little used. No. 3. From cistern in house similar to No. 2, but water generally used. No. 4. From pipe leading directly out of the bottom of cistern in well situated dwelling-house. No. 5. From cistern in smaller dwelling-house. No. 6. From small cistern supplying part of a house only. No. 7. From public well, supplied with Loch Katrine water from a wooden cistern closed at the top. No. 8. From cistern situated just under the slates in a house in a lower locality than the preceding houses. No. 9. From cistern over water-closet in a dwelling-house. No. 10. From cistern similar with last. No. 11. Taken from same cistern as No. 9, but after stirring up the muddy deposit at the bottom. No. 12. From cistern near the slates, in a house where there had been two cases of fever, and where the water was complained of.

Omitting for the present No. 11, it is found that No. 2 sample shows the highest numbers for free and for albumenoid ammonia, also for nitrates. Now this sample of water was taken from the cistern of a house in which the pipes have been recently entirely renewed, and in which the pipe leading from the water closet to the main drain is thoroughly ventilated. The water in this cistern is, however, very rarely used; for all domestic purposes, a supply is obtained directly from the main; it would, therefore appear that sewer gases are slowly absorbed by water stored in such a cistern.

That this absorptive action must take place slowly is evident if we look at the results obtained from the other waters. Although many of these waters were taken from badly situated cisterns, yet in none of them can the influence of sewer gases be distinctly traced. We must, therefore, conclude that the rapidity with which the water in the cisterns has been changed has prevented any appreciable action of the gases upon these waters. There are, it is true, slight variations in the numbers obtained, but in no case do we find a notable increase as compared with water from the main pipe.

The general conclusion to be drawn, therefore, is, that cistern waters are not, under ordinary circumstances, contaminated with sewer gases, but that if the water remains undisturbed for a considerable length of time in the cistern, it may become so contaminated; but that, even in such a case, the amount of contamination is inconsiderable.

House cisterns certainly soon become dirty, and when they have been used for some time, a deposit of mud or slimy matter is found at the bottom.

The amount of ammonia, etc., obtained from a sample of this slimy matter (diluted with the water itself, No. 11), indicated that a great part of the ammonium salts, etc., is concentrated therein; this matter may therefore perhaps exercise a certain beneficial effect upon the water.

It may be objected to these results, that a greater or less amount of free and albumenoid ammonia is no proof of the absorption of sewage gases by water, and that even if these gases are absorbed, their presence will not be indicated by a variation in the amounts of the two ammonias.

In order to test the accuracy of such an objection, the following experiment was performed. A quantity of distilled water, free from ammonia, was placed in a porcelain basin, which was covered with porous paper, and suspended at a short distance above the liquid in a sewer.

Through the kindness of the master of works of Glasgow, I was enabled to conduct this experiment in a sewer which receives the refuse of a very large area chiefly occupied by dwelling-houses. The basin was suspended during 96 hours, after which time the free and albumenoid ammonia in the water was estimated with the following results:—

Free ammonia = '60 milligrams per litre = parts per million.

Albumenoid = '54 „ „ „ „ „

Such a water as this would be at once condemned as largely contaminated with sewage. These results show, therefore, that the water has absorbed a large amount of nitrogenous organic matter; and further, that the exposure of water to the action of sewer gases does very decidedly alter the amount of free and albumenoid ammonia obtained in the analysis of the water.

The conclusions to which these measurements led me, are therefore these:—

1. That sewer gases are absorbed by water, and that their presence is rendered evident by an increase in the amount of free

and albumenoid ammonia, and also of nitrates, obtained from that water.

2. That this absorption takes place slowly.

3. And that in ordinary cisterns the water is not contaminated to any extent with sewer gases, probably because of the short time during which this water is allowed to remain in the cistern, and also perhaps because of the deposition of part of the impurities in the muddy substance which settles at the bottom of the cistern.

Professor ATTFIELD: I may state that this paper of Mr. Muir's is a continuation of the one he read last year. If you remember, he found that water kept in the cistern of a house contained a considerably larger quantity of nitrates than water taken from the main of the same house, and he explained that result on the assumption that the water had absorbed large quantities of sewer gas, which had become oxidized, and so yielded nitrates. In the paper he has now sent, he states that that conclusion was the result of only two experiments, that he has since made ten or a dozen, and he finds that the increase in the quantity of nitrogenous nitrates, caused by possible oxidation of sewer gas, is much less than those two experiments had led him to suppose.

The next paper read was:—

NOTE ON SOME INDIGENOUS TUSCAN REMEDIES.

By HENRY GROVES, FLORENCE.

Herbalism in Tuscany is by no means flourishing, nor has it been so for two or three centuries. This is to be attributed to the early establishment of hospitals, some of which were kept by monks. Now, these good friars, wise in their generation, knowing with what tenacity the sons of the soil hold fast to their coin, even the smallest, fostered the habit of taking their contributions in kind, and made yearly quests of wine, oil, and corn; so the countryman became identified with his hospital, and left herbs to take care of themselves.

To do justice to the contadino, he is not altogether an apostate from the ancient state of things, for he is withal a practical man, and seeks therefore to heal lesser ailments by wedding the curative with the culinary art; so he prepares numerous salads and fried meats with several of the *Cichoraceæ* which he finds on his own grounds, and which are reputed to be useful for this or that disease.

There are, however, a few simples to be found in the cupboard of every housewife; for what could be done without the capitula of *Matricaria Chamomilla*, which are used as a calming antispasmodic, and also applied hot externally as a means of relieving pain? Then there are the flowers of mallow, violet, lime, orange, and elder; the leaves of mallow, orange, walnut, and myrtle; with the soboles of couch grass and the roots of marshmallow, and a few others, varying in different districts. But with the foregoing enumeration we have by no means got to the end of our tether. For if housewives in general refuse to enlarge their indigenous remedies, and trust to tamarind for diarrhoea, tamarind for constipation, and tamarind for every other ailment,—tracing all disease to “riscaldamento,” or heat, in the same way as we English ascribe not a few disorders to “bile,” and the French to “glaires,”—there nevertheless are people who have a much more extensive materia medica, either obtained by observation or handed down to them as the shreds of an almost extinct herb-wisdom which flourished under the worthies of the fourteenth and fifteenth centuries, when medical practitioners identified themselves with research on indigenous remedies more than is the fashion in our day. A custom very prevalent in Tuscany is the administration of herb juice in the spring. It is prepared daily by many herbalists, and is also ordered by the faculty, and thus comes under the notice of pharmacists. The recipes that have come under my notice are varied, but two of the favourites are the following:—

R Beccabunga (Veronica).	R Ortica.
Nasturtio acquatico.	Bardana.
Fumaria.	Fumaria.
Cochlearia (officinalis).	Gallio (Salium).

Simple chicory juice is frequently used, and that of the nettle is highly esteemed. To all these succi it is usual to add a grain or two of ferri amm. chlor. or a few grains of sulphate of soda, and sometimes a drachm or two of compound syrup of rhubarb. The treatment is usually continued for a month, and the quantity taken is from three to four ounces of juice per diem. Of the herb-lore of the people, alas! little else than the monsters and griffins of the plant-world remain. The story of the mandrake still opens the eyes of little and big children, as some wise one tells of the dreadful power of the *Mandragora superiora*, of its long and slow growth, and of its deadly power over those who seek to uproot it. An old herb-collector whom I employ, thanks God that when he discovered

a mandrake it proved to be a false one, or he should have been a dead man !

In continuing this paper, I shall arrange such simples as I am aware of in their natural orders, so as to get them in some sort of shape. But before proceeding with the plants, let me observe that viper-broth is gone out of fashion, and the pharmacist is spared keeping those reptiles, and the pincers with which they were handled. Snail poultices are still used in the country. The snails are applied alive, the shell being crushed, or partially removed, and the snails set upside down on a piece of coarse paper ; they are then sprinkled with a little vinegar, and applied at once to the soles of the feet, on which they produce an irritation greater than mustard, which is supposed to be efficacious in some cases of fever.

To continue with the herbs. I will begin with the *Ranunculaceæ*, where we have *Aquilegia vulgaris*, used as a diaphoretic in doses of two to four grains; *Pæonia officinalis* as antispasmodic; *Ranunculus sceleratus*, when bruised, as a blistering agent. The hellebores are gone out of fashion, and *Aconitum Napellus* is supplied by the gardens—our indigenous aconites, *A. Lycoctonum* and *A. Cernuum*, not being used to my knowledge.

The *Nymphæaceæ* give a ready remedy for piles in the root of *Nymphæa alba*, but the difficulty is, that you must first get at the root, although the plant is extremely common in all our marshes. The remedy is used both as an electuary and an ointment.

Papaveraceæ yield *Papaver Rhæas*, called “rosalacci,” used in lozenges and syrup for coughs. *Chelidonium majus*, L., is used for wart curing, by means of its acrid juice. The root is also a drastic purgative.

Fumariaceæ give us *Fumaria officinalis*, L., very much employed for making herb-juice and syrup, which are supposed to be of service as depuratives.

The *Cruciferae* give us several remedies, not the least used being *Nasturtium officinale*, R.B., known as “crescione,” which enters into the composition of herb-juice, with *Cochlearia officinalis*, which is cultivated for that purpose, although indigenous. *Cochlearia Armoracia* is also used like the two foregoing, as an antiscorbutic remedy, in the form of a syrup. *Bunias Erucago*, L., *Lepidium latifolium*, L., have also been used as purifiers of the blood. *Cheiranthus Cheiri*, known as “viole gialle,” or yellow violets, are employed to make an oil, by simply boiling the flowers in olive oil, and is much used for enemata.

The *Violaceæ* give us two plants very much used : the first being

the flowers of *Viola odorata*, called "mammole," which make an excellent expectorant infusion; and the second, the *Viola tricolor*, called "pacea," which is used as a gentle cathartic in cases of infants' milk crusts. Its root, like that of the odorous violet, possesses emetic properties.

The *Polygalaceæ* yield us *Polygala amara*, used as an expectorant and tonic in chest diseases, and is prescribed by physicians.

The *Linaceæ* yield us *Linum usitatissimum*, now naturalized, from the seeds of which is prepared freshly an oil which is used as a laxative in many diseases of the liver, in cases of gout, worms, etc. When freshly prepared it is used in North Italy for salad dressing.

The *Malvaceæ* have always been a favourite order with herbalists. The decoction of fresh and dried mallow leaves (*Malva sylvestris*) being used most frequently, as also poultices of the leaves themselves. *Althæa officinalis*, L., *Lavatera arborea*, L., with *Hibiscus roseus*, Thor., and *Sida Abutilon*, Bert., are all employed in a similar way as demulcents, but more locally.

Tiliceæ yield the famous lime-flowers, which are the produce of *Tilia Europæa*, Vitm. The warm infusion of these flowers is very useful as a sudorific; moreover the taste is very agreeable, and it has been given to children instead of tea. The distilled water of lime-flowers is also extensively used as a vehicle for other medicines.

The *Aurantaceæ*, although not indigenous, are now so extensively cultivated in most parts of Italy that they cannot be passed over without notice. In Tuscany, with the exception of the bitter orange (*Citrus vulgaris*), which is more hardy, the different species are cultivated in large vases, which in winter are kept in "stanzoni," or large sheds, to protect them from the frost. The distilled waters of the fruits of *Citrus medica*, or cedro, as well as *Citrus Limonum*, are much used as sedatives, and the leaves of *C. vulgaris* and *C. aurantium* are much employed in infusion, the taste of which is very agreeable, and which is reckoned to be tonic and calming. The flowers of both the bitter and sweet orange, and the distilled waters from them, are all used extensively as sedatives.

The *Hypericaceæ* have their representative in *Hypericum perforatum*, from which an oil is prepared by boiling in olive oil, and which is used externally for worms.

The *Ampeledaceæ* yield us the vine, from the young shoots of which the tears are collected, and used as eye-lotion. The taste is almost imperceptibly astringent.

The *Rutaceæ* have at least two representatives, *Ruta graveolens*, Sav., and *R. angustifolia*, Pers., which are used internally for worms.

The latter species, which grows on barren hills, especially near the coast, is the one more generally employed.

The *Rhamnaceæ* give us the jujube (*Zizyphus sativa*, or *Singiolo*), now naturalized in some places. The fruit is used for demulcent decoctions, and enters into the much-used "Siroppo Inglese," or English syrup, which is used for children's coughs. The berries of *Rhamnus catharticus* are used for preparing a syrup for dogs, but in many districts is unknown.

The *Anacardiaceæ* yield us *Pistacia lentiscus*, L., from the berries of which an oil is prepared which is used for frictions, but also as a simple burning oil.

The *Leguminosæ* yield but few medicinal plants in comparison with their numbers, which in Tuscany is very great. *Lupinus albus*, L., yields seed which, when ground, is used for poultices, also internally for worms; it is also used to wash with, as a cosmetic. *Melilotus officinalis* is used as an anodyne. The roots of *Ononis spinosa* are diuretic and officinal. I cannot find that *Colutea arborescens*, L., or *Galega officinalis*, is now used medicinally. The meal of *Trigonella Fœnum Græcum* seed is used as a resolvent poultice. In former times it was much employed in oil (*olio di mucillaggini*), and ointment (*unguento d' arceô*).

The *Rosaceæ* have many remedial representatives. *Prunus Lauro-cerasus* takes first place, the distilled water being very much employed, chiefly for internal use. The flowers of *Amygdalus Persica*, L., are used for preparing a syrup which, if prepared by a cold process, possesses sedative properties, and has the taste of the syrup of Virginian cherry bark. The fruit-stalks of the cherry are used as a diuretic. The roots of *Geum urbanum*, called "gariofilata," are used as a febrifuge and astringent. The fruits of *Rubus Idæus*, which grows in mountain woods, but is not cultivated, are used for a flavouring syrup; but blackberries, called "more di macchia," yielded chiefly by *Rubus discolor*, Weih and Nees, are employed more than any other remedy as a syrup. It is very useful for gargles and mouth-washes. The leaves of the bramble are used in decoction for relaxed sore-throats. *Potentilla reptans*, L., called "pentafilello," and *P. Tormentilla*, are used for staunching blood. The decoction of *Poterium Sanguisorba* is used for washing wounds. The flowers of *Spiræa Ulmaria*, a rare plant in Tuscany, have been used as a diuretic in dropsy.

The *Granatææ* give us the useful *Punica granatum*; the rind of its fruit, and more especially the bark of its root, are used for tape-worm, and with very great success. The bark of the root should

be fresh to produce effect. A syrup is also made of the fruit, but it is seldom used.

The *Myrtaceæ* yield us *Myrtus communis*, a very common plant on stony ground, especially near the coast. Its leaves are used in powder as an astringent for dusting babies. The distilled water of the leaves and flowers is sold at the cheap rate of 5*d.* per half-gallon flask, and is much used as a corroborative lotion for the toilet of ladies.

Of the *Cucurbitaceæ*, *Ecbalium elaterium*, Reich., takes first place. It is common enough in waste places, near the shores of lakes or by the sea, but in Italy its use is very slight. The seeds of *Cucurbita maxima* and *C. Pepo*, which are extensively cultivated but not indigenous, are used for expelling tape-worms, and to my knowledge are effectual in doses of not less than four or five ounces of the peeled seed. A dose of castor-oil is given prior and subsequent to the dose of seed.

In the *Crassulaceæ*, the juice of *Sempervivum tectorum* found in mountain rocks, and cultivated on tiles, is used for aphtha. It has also been employed for epilepsy in the same way as another of this order, *Cotyledon umbilicus*, Dec., has been used in England.

The *Umbelliferae*, which in southern climates have so many vigorous and striking members, yield a fair share of remedies, *Conium maculatum* being one of the principal. Its extract is used in ointment for the reduction of hard swellings, and is frequently united with iodide of potassium. The leaves are used with good effect as a poultice, and now and then conia is prescribed. *Oritimum maritimum* is used as a diuretic. *Enanthe Phellandrium*, Lam., yields fruits which have been much lauded for pulmonary complaints; they have a very strong and distinct smell, and possess sedative and carminative properties. The preparations are the tincture and the infusion. Dose of the seed, from five to ten grains. *Foeniculum officinale*, All., with its two varieties, "*piperitum*" and "*dulce*," are used as stomachics; the green fruits of the latter are much eaten with bread as a condiment. *Foeniculum dulce* is only found in gardens, whereas *F. officinale* grows on dry hills in many parts of Tuscany. These two varieties require study and experimental cultivation, being so different from the mother-plant as to suggest two different species. *Opoponax Chironium*, Koch, which is found in several parts of Tuscany, is said by Savi to yield gum at Piombino.

In the *Loranthaceæ*, both *Viscum album*, L. (or "*visco*") and *Loranthus Europæus* or ("*visco quercino*") are sparingly employed as demulcent decoctions.

In the *Caprifoliaceæ*, both the fruit and flowers of *Sambucus nigra* and *S. Ebulus* have been used as sudorifics, drunk in warm infusion.

Of the *Rubiaceæ*, two or three species of *Galium* are employed, such as *G. verum*, L., called "gallilo" or "cagialatte," from its property of turning milk, used as an antispasmodic and diaphoretic. *Galium Mollugo*, L., for the gout. *G. cruciata*, Scop., called "valanzia," is used as a depurative in herb-juice, although the earlier and similar *G. verum*, Scop., is most frequently used instead.

The *Valerianaceæ* yield us the root of *Valeriana officinalis*. Some of the mountain valerians, such as *V. montana*, L., *V. saxatillis*, L., and *V. Saliunca*, Ten., have roots possessing great strength of odour, and probably have the same value as the officinal plant, but are unused.

The *Compositæ* of course give many remedies. Our old friends, *Tussilago Farfara*, *Inula Helenium*, and *Arctium Lappa*, are used for the same purposes as in England. The tops of *Achillea millefolium* are used as a stomachic, and in some places, both *A. Ageratum* and *A. tomentosum* are used for the same purposes. *Santolina pinnata*, the prettiest of all our santolinas, an exclusive habitant of our Carrara Mountains, is used by the quarrymen as a vulnerary in the form of oil, poultice, etc. *Matricaria chamomilla*, L., is the camomile employed by the Italians, and to them indispensable. It is used as a carminative in infusion, and the flowers are frequently sprinkled over charcoal pans for the purpose of giving a grateful odour throughout the house. *Artemisia Absinthium* is frequently used as a bitter, *A. camphorata* as a stomachic, and *A. vulgaris* as an alterative. *Tanacetum vulgare* is used, in infusion, for worms. The seeds of *Onicus benedictus*, L., have been used as an emetic. The leaves of *Oichorium Intybus*, L., are much used for herb-juice, and the wild plant is one of those which enters into the "field salad" together with the tender plants of *Zacintha verrucosa*, *Hyoseris radiata*, *Taraxacum officinale*, *Picris hieracioides*, and several species of *Crepis*, and on the sea-coasts, *Picrodium vulgare*. The leaves of *Leontodon Taraxacum* are used, but the root is not employed by the Italians; it may be on account of the difficulty of obtaining them, as the herb-gatherers have a decided preference to things growing above ground, and thus more easily obtained.

The *Vacciniæ* furnish us with *Vaccinium Myrtillus*, L., *V. uliginosum*, L., and *V. Vitis-idæa*, L., the leaves of all of which have been used for the same purpose as *Uva ursi*, which in Tuscany is extremely rare.

The *Ericaceæ* give us *Arbutus Unedo*, called "albatro," from the ripe fruit of which a spirit called "corbezzoli" is distilled, and also vinegar is made.

The *Jasminaceæ*, with the olive and manna ash, are too well known to require description, but they yield other medicinal plants. The bark and young shoots of *Phillyrea vulgaris*, Caruel, called "lillatro," which grows plentifully in our fever-stricken maremma, are used as a febrifuge, and its alkaloid phillyrine is also employed in doses double that of quinine. The plant is supposed to increase the quantity and quality of milk when eaten by cattle. Excellent sweet oil can be prepared from the ripe berries of privet, but a friend of mine who experimented upon them told me that they did not pay the expense of collecting.

In the *Apocynaceæ*, the leaves of *Vinca minor*, *V. media*, and *V. major*, have been used as diaphoretics and astringents.

The *Asclepiadaceæ* yield the once famous *Vincetoxicum officinale*, now almost disused.

The *Gentianaceæ* of our Tuscan mountains do not reckon amongst them *Gentiana lutea*, although I have found it much further south in the Abruzzi. In the herb shops of the "semplicisti," one finds the so-called lesser gentian, which is yielded by *G. Asclepiadea*, and also probably by *G. cruciata*, both of which have large roots, and are of frequent occurrence in our mountain pastures. *Erythraea Centaurium* and *Menyanthes trifoliata* are both used as bitters; the latter is a rare plant with us.

In the *Convolvulaceæ* the root of the *Convolvulus Soidanella* has been employed as a purgative.

The *Boraginaceæ* supply us with *Borago officinalis*, now used more a potherb than as a remedy. The root of *Symphytum officinale* is used as a tonic, and as a cooling application to wounds. *Pulmonaria officinalis* is used for its mucilaginous properties. *Cynoglossum officinale* gives its name to a famous pill-mass, which contains the powdered root and extract of opium, in the proportion of a tenth of each, besides other ingredients.

The *Solanaceæ* yield us *Dulcamara*; the *Atropaceæ*, *Stramonium*, *Henbane*, and *Belladonna*. From the green leaves of the two latter an oil is made by boiling in olive oil until the leaves become crisp. These oils are much used for frictions.

In the *Scrophulariaceæ* we use the flowers of *Verbascum Thapsus* and allied species for making expectorant infusions. *Scrophularia nodosa* and *S. peregrina* have been used for scrofula, but have few believers now. *Gratiola officinalis* is now very rarely employed as a purgative

for worms. Our supply of digitalis leaves is derived from cultivated plants, as *Digitalis purpurea* is not indigenous. The so-called lesser digitalis, or *D. lutea*, is a very common plant, and is sometimes employed. *Veronica Beccabunga* is one of the favourite plants for herb-juice, and frequently *V. Anagallis* is mixed with it.

The *Acanthaceæ* yield us *Acanthus mollis*, which, when more plentiful than it is now, was much used as an emollient for clysters. The leaves and root were both employed. Now the plant has become rare.

In the *Verbenaceæ*, *Verbena officinalis*, called "erba santa," is used boiled in vinegar, as a poultice for liver complaints. It is also taken internally for the same purpose, and for dropsy. The seeds of *Vitex agnus castus*, slyly called "pepe pei monaci," are supposed to have cooling properties.

The *Labiataæ* contain a host of aromatic plants, which give a distinct odour to our barren hills, especially under the fierce sun of summer. The following are used as carminatives:—*Mentha rotundifolia*, *M. Pulegium*, *Origanum vulgare*, *Thymus Serpyllum*, *Satureja hortensis*, *S. montana*, *Micromeria græca*, *Calamintha parviflora*, *C. Arvensis* and *C. Elinopodium*, with *Melissa officinalis*. *Salvia officinalis* makes a very useful decoction for sore throats. The leaves of rosemary with cypress cones are boiled in wine, and used for washing weakly children. *Nepeta Glechoma* is used as a strengthening and alterative infusion, *Teucrium Marum* as an emmenagogue, *Marrubium vulgare* for coughs, and *Ajuga Chamæpitys* as a tonic.

The *Plantaginaceæ* give us *Plantago lanceolata*, which is used for making a distilled water used for the eyes. This water had a reputation for staunching blood. *En passant* I may mention that there is a water distilled wholly from herbs, according to its author, Dr. Capodiceci, of Naples, which possesses the property of coagulating blood in a greater degree than ferri perchloridum. I have seen it employed with the best success, and it has also been extensively used by Professor Schiff, who reports it as a wonderful and most useful invention. What can it be?

The *Thymelaceæ* have as representatives *Daphne Laureola*, *D. Gnidium*, and *D. Mezereum*, all of which have been employed for blistering purposes, the bark being macerated in vinegar. *Daphne Mezereum* alone is used internally in weak infusion for syphilitic complaints.

In the *Aristolochiaceæ*, *Asarum Europæum*, *Aristolochia Clematitis*, with *A. rotunda* and *A. pallida* have all been used as emmenagogues, but are now very rarely employed.

The *Urticaceæ* yield us hemp, the seeds of which are employed in emulsion for irritation of the bladder. The leaves and shoots of *Humulus Lupulus* are reputed to be an alterative tonic. Two or three species of *Urtica* are used for making herb-juice, such as *Urtica membranacea*, *U. urens*, and *U. dioica*; the first is the most employed, as the mania for herb-juice takes us in early spring, when the first mentioned is in full flavour. The fruits of *Ulmus campestris* at the latter part of June are filled with a mucilaginous fluid, sought after by the country people as a vulnerary. The leaves of *Juglans regia* are extensively employed in Tuscany, frequently for making astringent injections, or as extract taken in pills as a tonic and depurative.

In the *Amentaceæ* the bark of *Salix alba* is used in decoction, but more frequently its alkaloid is prescribed. The buds of *Populus nigra* are used to make unguentum populeum, used for piles. This ointment keeps very well for years, thanks to the preservative quality of the balsam contained in the poplar shoots, which moreover have been used in decoction for coughs.

Taxus baccata (*Taxaceæ*) has been employed instead of digitalis, in doses of eight to sixteen grains, but I have never seen it prescribed.

In the *Coniferae*, the fruits of *Juniperus communis* are much used in extract, which frequently enters into the composition of tonic elixirs. The country people make a decoction of the berries in wine for colds and rheumatism. The cones of *Cupressus sempervirens*, as mentioned before, are boiled in wine for making a strengthening application for children. *Pinus pinea*, L., of which large tracts exist in Tuscany, mixed with *Pinus pinaster*, yields the little almond-like seed called "pinocchio," which is sometimes emulsed as the almond.

In the *Amaryllideæ*, *Narcissus pseudo-narcissus* has been used as an antispasmodic, the bulb and the seed being little employed, but a syrup is made of the flowers. In large doses it is emetic, and even poisonous.

Smilax aspera, or native sarsaparilla, representing the *Smilacaceæ*, grows abundantly on stony hills. The *Asparagaceæ* yield us several medicinal plants. The roots of *Ruscus aculeatus* are used as a diuretic, as also those of *Asparagus officinalis*. The asparagus roots found in the shops are nearly always those of *Asparagus tenuifolius*, Lam., a beautiful little species growing plentifully in moist woods round Florence, and possessing the same properties as *A. officinalis*.

In the *Liliaceæ* we have *Urginea Scilla*, which grows here and

there on the sea-coast, especially of the islands of the Tuscan archipelago. From the tuberous roots of *Asphodelus macrocarpus*, Viv., called "porraccio," is made the asphodel spirit in the maremma.

In the *Colchicaceæ*, *Colchicum autumnale* is very common, and the tincture is sometimes used externally.

The *Aroideæ* give us *Arisarum vulgare*, Pal., the tuberous root being used as an emetic instead of ipecacuanha. The leaves of *Arisarum Italicum*, Mill., called "gicheri," are used for dressing blisters. The roots are eaten by pigs, and, according to Orosi, contain 71 per cent. of starch.

The *Cyperaceæ* yield us *Cyperus aureus*, var. *esculentus*, the tubers of which, called "bacicci," were used for demulcent decoctions. They are no longer cultivated in Tuscany.

The *Graminaceæ* give us *Arundo Donax*, the handsome flag one sees everywhere in Italy, and which supplies us with blinds, fishing-rods, fences, laths, etc., etc. The root of this is much used for removing milk. The infusion of the sobules of *Triticum repens* is also much employed as a diuretic, and an extract made of the same is used as a simple extract for pill masses.

The *Filices* have several representatives, all used more or less for the expulsion of worms. For this purpose *Osmunda regalis*, or "felce florida," has been used, as well as for a tonic for children. *Ceterach officinarum* and *Polypodium vulgare* have also been tried as vermifuges, but with so little success that they are now out of use. *Adiantum capillus-veneris* is much used in syrup for coughs, and possesses the advantage of an agreeable taste. *Aspidium filix-mas* holds its own here, as everywhere, and its rhizome is frequently used in powder.

In conclusion, I may say that the collection of herbs generally takes place, not at some phase of the moon, but on some saint's day. Every plant is supposed to possess its full virtue at that certain epoch, but this does not prevent herb-collectors from securing a good gathering whenever they get the chance, and the saint kicks the beam when weighed against a few centimes.

The PRESIDENT: I am afraid you will consider me a somewhat prejudiced estimator of the value of this paper, the writer being my brother, but still I think I may ask you to pass him a cordial vote of thanks.

The vote was carried unanimously.

Professor ATTFIELD then read a paper—

ON THE ESSENTIAL OILS OF WORMWOOD, CITRONELLA, AND CAJEPUT.

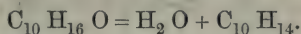
By C. R. A. WRIGHT, D.Sc.LOND.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

I. Essential oil of wormwood (*Artemisia Absinthium*, L.)—A sample of pure oil yielded the following results on fractional distillation:—

- a. About 1 per cent. was a terpene, boiling at about 150°.
- b. A somewhat smaller quantity was another terpene, boiling between 170° and 180°.
- c. The majority was the oxidized body, of formula $C_{10}H_{16}O$ (isomeric with camphor and with myristicol from nutmeg oil), termed by Gladstone *absinthol*. This product was first obtained by Leblanc, and stated by him to boil at 204°; Gladstone subsequently gave the boiling point 217°; the substance examined by the writer boiled at 200° to 201° (corrected); whilst Beilstein and Kupffer have stated, in a paper published whilst these experiments were in progress, that the boiling point is 195°.
- d. A few per cents. were the "blue oils," boiling at 300° and upwards, together with a little of a resinous substance not volatile at 350°.

Absinthol differs from its isomeride myristicol (which boils about 12° or 15° higher) in that it is not appreciably altered in any way by repeated distillation; like this substance it splits up into water and cymene by the action of zinc chloride.

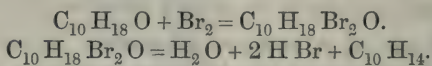


Phosphorus pentasulphide similarly abstracts the elements of water (evolving sulphuretted hydrogen), and produces cymene: simultaneously some cymyl-sulphyhydrate, $C_{10}H_{13}.SH$, is formed, apparently identical with that obtained from camphor by a similar reaction.

II. Essential oil of citronella (*Andropogon Schoenanthus*).—This oil mainly consists of an oxidized substance boiling near 210°, but altered by continual heating, becoming partially resinized, and losing partially the elements of water; this substance gave numbers agreeing with the formula $C_{10}H_{18}O$, which is corroborated by its behaviour with bromine, zinc chloride, etc. Gladstone, however, obtained from this oil a body boiling at 199°–205°, and giving numbers agreeing with the formula $C_{10}H_{16}O$; whence it seems probable that the constituents of an essential oil from a given plant,

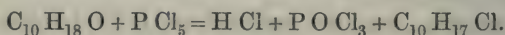
may be subject to variation according to the season, age of plant, soil, etc., etc.

This oxidized product, *citronellol*, unites with bromine energetically; the resulting dibromide breaks up on heating into water, hydrobromic acid, and cymene.

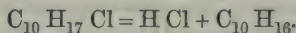


Zinc chloride removes the elements of water, forming a terpene, mixed, however, with other hydrocarbons.

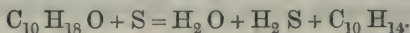
Phosphorus pentachloride acts in accordance with the following equation:—



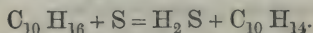
The resulting chlorinated product breaking up on heating into hydrochloric acid and a terpene together with polymerides of the latter.



Phosphorus pentasulphide first removes the elements of water, forming a terpene, and then acts on the nascent terpene, converting it into cymene, and evolving sulphuretted hydrogen:—



Just in the same way, the terpenes of orange peel oil (*Hesperidene*) and of oil of turpentine are converted into cymene by phosphorus pentasulphide, sulphuretted hydrogen being evolved.



III. Essential oil of cajeput (*Melaleuca Leucodendron*).—Schmidt has shown that the chief constituent of this oil is a body of formula $\text{C}_{10}\text{H}_{18}\text{O}$, boiling at about 177° , and hence isomeric with citronellol, which boils about 30° to 35° higher; the product isolated by fractional distillation boiled at 176° to 179° , and gave, with various reagents, results closely analogous to those obtained with citronellol; thus, with bromine, it forms a dibromide, splitting up into water, hydrobromic acid, and cymene on heating; a much larger yield is, however, obtained with oil of cajeput than with citronella oil.

Phosphorus pentasulphide similarly forms, firstly, a terpene, and by further action cymene.

During the above experiments, and those brought before the Conference in former years, sixteen different specimens of cymene

have been obtained by one or other process from different substances, all constituents of essential oils, and all either members of the class of terpenes, or closely related to them. The specific gravity, specific refractive energy, and specific dispersion of them have been taken by Dr. Gladstone, all the specimens being found to agree closely together; the boiling point of each specimen has been found to be very close to 176.5° , and in every case the action of potassium dichromate and sulphuric acid was the same, viz., the production of terephthalic acid (about 40 per cent. on an average) free from isophthalic acid, and of acetic acid free from all trace of higher homologues. From these results, it is concluded, firstly, that the cymene thus producible is in every case the same body; and secondly, that the terpenes and their derivatives of formulæ, $C_{10}H_{16}O$ and $C_{10}H_{18}O$, are closely related to this hydrocarbon, which may, indeed, be looked upon as the central form of matter from which all these classes of substances are derived.

The PRESIDENT: Dr. Wright's paper is, as usual, of a highly scientific character, and worthy of being termed classical. I am afraid it is above the reach of our criticism, and that we must content ourselves with passing him a vote of thanks.

The vote of thanks having been carried,

Professor ATTFIELD read the next paper, also by Professor Wright:—

NEW DERIVATIVES FROM THE OPIUM ALKALOIDS.

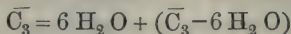
By C. R. A. WRIGHT, D.Sc.LOND.,

Lecturer on Chemistry in St. Mary's Hospital Medical School.

During the past year the following results have been obtained:—

The first product of the action of zinc chloride on codeine was stated by Matthiessen and Burnside to be formed by the abstraction of the elements of water from codeine, and was hence termed "apocodeine." This observation has, however, been found to be partly incorrect: the first products of the action of zinc chloride are the codeine polymerides described in a paper read before the Conference in 1872, viz., *Tricodeine* and *Tetracodeine*, the former predominating. Zinc chloride alone does not seem to exert any dehydrating effect on tricodeine: but when heated with hydrochloric acid, this base forms a product apparently identical with "apocodeine," which is there-

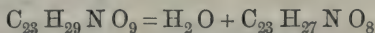
fore, really a secondary product formed from tricodeine by the removal of six proportions of water.



may consequently be termed *Hexapotricodeine*.

Experiments on narceine have been commenced; this alkaloid, although so feebly basic that its salts are partially decomposed by water, has nevertheless a strong attraction for a small quantity of hydrochloric acid. When the hydrochloride is crystallized from a liquor containing 8-10 equivalents of hydrochloric acid to 1 of narceine, crystals are formed, of composition $\text{C}_{23}\text{H}_{29}\text{NO}_9, \text{HCl}, 3 \text{H}_2\text{O}$; the water of crystallization is mostly lost on standing over sulphuric acid (all save about 1 per cent.); on the other hand, the salt dehydrated at 100° gains about 1 per cent. in weight, but no more over sulphuric acid; when dissolved in 50 parts of boiling water, crystals form on cooling, having the composition $6 \text{C}_{23}\text{H}_{29}\text{NO}_9 + \text{HCl}$; these lose part of the associated hydrochloric acid by long-continued digestion with water; but the whole cannot be thus removed, nor can the base be obtained wholly free from hydrochloric acid, even by precipitation by sodium carbonate, and three successive crystallizations from boiling alcohol; the basic hydrochlorides, $5 \text{C}_{23}\text{H}_{29}\text{NO}_9 + \text{HCl}$ and $10 \text{C}_{23}\text{H}_{29}\text{NO}_9 + \text{HCl}$, recently described by Petit, do not appear to be definite compounds, nor does the last formula indicate the end product of the action of water on narceine hydrochloride, as stated by Petit.

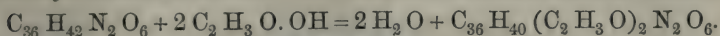
When narceine is heated with excess of strong hydrochloric acid to 100° for an hour, the elements of water are abstracted, and a new base formed; this is non-crystalline and yields non-crystalline salts, the hydrochloride being precipitated from aqueous solution in amorphous flakes, by addition of strong hydrochloric acid; physiologically this new product appears to be almost inert, no appreciable symptoms following the subcutaneous injection into dogs and cats of quantities up to two decigrammes; its mode of formation is indicated by the equation—



the empirical formulæ of narceine and the new product being employed.

The actions of organic acids and their anhydrides on the opium (and other) alkaloids are now under investigation; the following points have been made out:—When codeine is heated with twice its weight of glacial acetic acid, to boiling, for eight to ten hours, an

inverted condenser being attached, the majority is converted into *diacetyl codeine*, thus,—



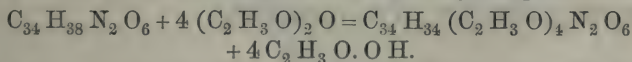
This new product is crystallizable from alcohol, ether, benzol, and chloroform, in which it is readily soluble, and from boiling water, in which it is sparingly soluble; a minute amount of codeine is, however, re-formed by the action of the water, by the reversal of the above equation: this action takes place completely when the base is heated to 150° in a sealed tube, containing just enough potash to saturate the acetic acid liberated. The crystallized hydrochloride of this base contains $\text{C}_{36}\text{H}_{40}(\text{C}_2\text{H}_3\text{O})_2\text{N}_2\text{O}_6$, 2HCl , $4\text{H}_2\text{O}$.

When acetic anhydride acts on codeine, either at the ordinary temperature for two or three weeks, or for an hour or more at 100° or 130° , the same product is formed; no more highly acetylated substance being in any case producible.

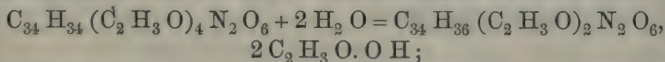
Boiling acetic acids acts in the same way on morphine.

$\text{C}_{34}\text{H}_{38}\text{N}_2\text{O}_6 + 2\text{C}_2\text{H}_3\text{O}.\text{OH} = 2\text{H}_2\text{O} + \text{C}_{34}\text{H}_{36}(\text{C}_2\text{H}_3\text{O})_2\text{N}_2\text{O}_6$; the base thus formed is termed a *diacetyl morphine* to distinguish it from another isomeride obtained by the action of acetic anhydride on morphine; it is soluble in ether, but cannot be crystallized from ether, alcohol, or benzol, appearing only as a gum or varnish; when precipitated by ammonia or sodium carbonate it is also amorphous; excess of ammonia, potash, or sodium carbonate readily dissolves it. Its hydrochloride is crystalline, and but sparingly soluble in water, as is also the nitrate; the former salt contains $\text{C}_{34}\text{H}_{36}(\text{C}_2\text{H}_3\text{O})_2\text{N}_2\text{O}_6$, 2HCl , $6\text{H}_2\text{O}$; it gives no colour reaction with ferric chloride.

Excess of acetic anhydride, either at the ordinary temperature or at 100° or 130° , converts morphine into *tetracetyl morphine*, thus—

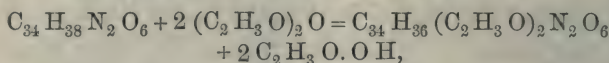


This base resembles diacetyl codeine, being readily crystallizable from alcohol, ether, or benzol, and being but sparingly soluble in excess of ammonia or sodium carbonate; caustic potash, however, dissolves it readily; its hydrochloride is excessively soluble in water, but can be obtained in crystals. Boiling water acts on tetracetyl morphine, forming a diacetyl morphine acetate thus—



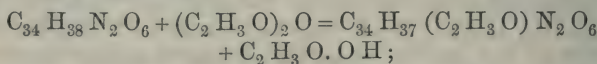
in sealed tubes at 150° the action goes further, morphine being reproduced.

When morphine is heated to 100° for an hour with just the quantity of acetic anhydride required for the equation,



the reaction thus indicated takes place; the main product, however, is not *a* diacetyl morphine, but an isomeric substance (termed *β* diacetyl morphine) differing from the *a* base in that it yields a blue colour with ferric chloride, and that its hydrochloride is excessively soluble in water and is non-crystalline, its solutions drying up to a gum over sulphuric acid. The ammoniacal solution of the *β* base deposits morphine on standing; and the hydrochloride deposits crystals of morphine hydrochloride on standing in contact with excess of hydrochloric acid; the base itself is non-crystalline, and is readily decomposed by boiling water, producing morphine. It is especially noteworthy that although both diacetyl morphines are produced by the action of acetic anhydride not in excess, and of acetic acid on morphine, the *β* base very greatly predominates in the first case, the *a* base in the second. Butyric acid seems to give a similar pair of butyryl derivatives; these and analogous substances from strychnine, quinine, etc., are now undergoing investigation, as are also many other points suggested by these experiments.

When only a small quantity of acetic anhydride is used the product is *monoacetyl morphine*—



this body very closely resembles *β* diacetyl morphine; its production affords another proof of the necessity of writing the formulæ of morphine and codeine, $\text{C}_{34}\text{H}_{38}\text{N}_2\text{O}_6$ and $\text{C}_{36}\text{H}_{42}\text{N}_2\text{O}_6$, instead of $\text{C}_{17}\text{H}_{19}\text{NO}_3$ and $\text{C}_{18}\text{H}_{21}\text{NO}_3$ respectively.

The PRESIDENT: Dr. Wright has been working away for some time at these morphia derivatives, and has achieved many interesting results. I fully expect that in course of time he will light on facts that will lead to very startling conclusions. The amount of labour he spends on these researches is something marvellous. We are all indebted to him for sending his papers to us.

A vote of thanks was passed.

The PRESIDENT read the following paper on "The Preparation of Trimethylamine."

TRIMETHYLAMINE FROM SKATE.

BY T. B. GROVES.

The skate (*Raia Batis*) is a fish endowed with many peculiarities both of shape and substance. It is largely consumed by the poor on the south coast, and in the form of crimped skate is sometimes met with at the table of the rich.

I once, when they were particularly cheap, endeavoured to cure some as Finnan haddocks are preserved. For the first week or so they were well appreciated, but afterwards they acquired an ammoniacal flavour so very pronounced that it was impossible to proceed with them. There was no putridity whatever apparent. On mentioning this to my porter, he at once said it was nothing new, they had simply become . . . here he used a vernacular expression impossible to ears polite, in which the letters "p" and "s" figured prominently.

On further inquiry I was informed that this peculiarity was regarded by some low-lived gourmets as its crowning excellence; so much so, that it was never eaten until it had been hung up and could be smelt from one end of the ship to the other—"De gustibus non est disputandum."

Having never met with a fish that behaved so singularly, I determined some day to make experiment with it. I was reminded of the circumstance by the introduction of trimethylamine or propylamine, as it has been erroneously termed, into medical practice.

Early in June this year, I received two skate, weighing together about eleven pounds. I kept them three or four days till they smelt strongly, then cut them up, and put them into a copper still, with a little water and a lump (about six ounces) of washing soda. (The use of a copper still was of course not advisable, but I had no other that was convenient.) On passing in steam, I obtained a strong smelling distillate, blue in colour, from dissolved copper. This was collected so long as it was worth anything, then neutralized with hydrochloric acid, and evaporated to one pint. The copper was now removed with sulphuretted hydrogen, and the liquid, then further reduced in volume, was redistilled with caustic soda, the vapours evolved being condensed in hydrochloric acid, the recipient being well shaken. The solution, evaporated to dryness to expel excess of acid, was treated with rectified spirit. The muriate of trimethylamine passed into solution, leaving the muriate of ammonia that accompanied it undissolved; of the former I thus obtained six

drachms, of the latter about double that quantity. This, considering all things, is, I believe, a good yield, and the relative quantities of the two substances not so disproportionate as they commonly are.

I would caution any one anxious to repeat my experiment, to avoid wearing his ordinary habiliments on the occasion, or he will find his friends strangely indifferent to his acquaintance, and undesirous of his proximity, for a month or two after.

Mr. HANBURY proposed a vote of thanks to the President for his paper, which was at once carried.

Mr. WILLIAMS: I have listened with a good deal of pleasure to this paper, because I have had considerable experience in preparing trimethylamine. I generally prepare it from herring-brine, but sometimes that source is not available, so that last winter I had to prepare a considerable quantity from sprats. I have also used fresh herrings themselves. Of course the trimethylamine produced is more brown when you distil the fish itself, than when you distil the brine. I do not know whether you, sir, found much impurity when using skate in this way, or whether the distillate came over at first very brown, and had to be purified several times. I found, when using herrings or sprats, that the distillate contained a great deal of tarry animal oil, which gave us some trouble to separate; but that is not the case when using brine.

The PRESIDENT: There was no tarry oil, but there was a small quantity of oil floating, which I separated readily by the filter. The trimethylamine has been re-distilled.

Mr. WILLIAMS: I suppose you find the hydrochlorate of trimethylamine made in this way is not quite solid.

The PRESIDENT: No; not quite. I evaporated it as far as it would go until it lost no further weight, and then poured it into a bottle while hot, and it set into a semi-solid mass, which by shaking I find has become liquid.

Mr. WILLIAMS: By leaving in 10 per cent. of chloride of ammonium you can make it sufficiently solid to dispense and manipulate.

The PRESIDENT: I think I understood you to say you are in the habit of obtaining a much larger yield of ammonia in company with the trimethylamine; it is not so here. Did you use caustic soda?

Mr. WILLIAMS: No; I used caustic lime.

The PRESIDENT: No doubt it was its action upon the albumenoids which produced the excess of ammonia.

Mr. WILLIAMS: I do not know whether you came to the conclu-

sion that the trimethylamine exists, not in the flesh of the fish itself, which was my first idea, but I have now come to the conclusion that it probably entirely resides under the scales.

The PRESIDENT: I have not arrived at any conclusion on that point.

This concluded the reading of papers.

PLACE OF MEETING IN 1875.

It was resolved unanimously that the invitation to meet next year at Bristol be accepted.

ELECTION OF OFFICERS.

Professor ATTFIELD then read the following list of officers proposed for the next year. The gentlemen nominated were unanimously elected by the meeting.

President.

THOMAS B. GROVES, F.C.S., Weymouth.

Vice-Presidents who have filled the office of President.

Professor BENTLEY, F.L.S., M.R.C.S., London.

D. HANBURY, F.R.S., London.

W. W. STODDART, F.C.S., F.G.S., Bristol.

H. B. BRADY, F.R.S., Newcastle-on-Tyne.

Vice-Presidents.

T. H. HILLS, F.C.S., London.

R. REYNOLDS, F.C.S., Leeds.

CHARLES BOORNE, Bristol.

PETER SQUIRE, F.L.S., London.

Treasurer.

G. F. SCHACHT, F.C.S., Clifton, Bristol.

General Secretaries.

Professor ATTFIELD, Ph.D., F.C.S., 17, Bloomsbury Square,
London, W.C.

F. BADEN BENDER, F.C.S., 7, Exchange Street, Manchester.

Assistant Secretary.

R. H. DAVIES, F.C.S.

Local Secretary.

JOHN PITMAN, Redcliff Hill, Bristol.

Editor of the Year-Book.

LOUIS SIEBOLD.

Editor of the Transactions.

Professor ATTFIELD.

Other Members of the Executive Committee, 1874-5.

M. CARTEIGHE, F.C.S., London.

R. W. GILES, Clifton.

W. A. TILDEN, D.Sc., F.C.S., Clifton.

C. EKIN, F.C.S., Bath.

T. GREENISH, F.C.S., London.

W. MARTINDALE, F.C.S., London.

F. M. RIMMINGTON, F.C.S., Bradford.

C. TOWNSEND, Bristol.

C. UMNEY, F.C.S., London.

Auditors.

F. ANDREWS, London.

E. SMITH, F.C.S., Torquay.

The PRESIDENT: On behalf of myself I have to thank you for your renewed confidence. It is very complimentary indeed that I should for two years fill the office of President. I assure you I have had a great fight to get out of it, not because I find the duties too onerous, but to give a chance to others who I think ought to aspire to fill the chair, and who I know would fill it much better than I can. However, my proposition was voted revolutionary; it was decided I should remain here, and therefore I can only assure you I will do my utmost to fill the post with something like efficiency.

Mr. SCHACHT: I rise to fulfil a very pleasing duty indeed. Meeting in this house, as we have done on this occasion, it has perhaps appeared to some that we were taking things as a matter of course, and that all the arrangements were the result of the organization belonging to this establishment. For all that, we are very grateful, and we shall express our thanks in a formal manner for the use of this establishment presently. But I must caution you against thinking that there ends our obligation. It is also due to another set of gentlemen who have laboured very hard indeed for our benefit. I allude to the local committee, whose labours have been very arduous, extending over a long time. During the last few days we have all witnessed with what energy they have worked

to carry out the arrangements of this meeting. For the splendid hospitality which has been offered us, and which is proposed still further for our acceptance, we must, I am sure, all feel very grateful indeed, and you will therefore allow me to propose:—

“That the best thanks of this meeting be given to Mr. Carteighe, Professor Attfield, and the other members of the local committee, for their efforts in organizing the present meeting.”

Mr. BENDER: I am very glad to have the opportunity of seconding this resolution. The success of our Conference has always been very largely due to the efforts of the local committees in the towns we have visited, and never have we had greater cause for thankfulness than on this occasion. In coming to the house of the Pharmaceutical Society, surrounded by so many pleasant associations, we expected to have a pleasant meeting; but I am sure we are indebted to the local committee for adding very much to what we expected to find here, and for their thoughtfulness in promoting, in many ways, our comfort and convenience. Although we have come to the end of the business to-day, we have not yet come to the end of the kind offices of the Committee. As you are aware, to-morrow we are still to reap their kindness, and our gratitude is therefore due not only for what is past but is certainly a “lively anticipation of favours to come.”

The resolution having been carried unanimously,

Mr. CARTEIGHE acknowledged the vote of thanks, and took the opportunity to bear testimony to the continued and unwearied exertions of Professor Attfield from the foundation of the Conference to make it successful in every respect. He did really deserve the best thanks of the Conference on that account, for he (Mr. Carteighe) certainly did not know any man who would have worked for ten years in its behalf, as Professor Attfield had done.

The PRESIDENT: The next resolution is:—

“That the most cordial thanks of the Conference be given to the President and Council of the Pharmaceutical Society, for the use of their lecture theatre and other rooms for this meeting, and for the cordiality with which they have welcomed the Conference.”

Seeing the manner in which we have been received by the Council and President of the Society, I know you will accord to them a very sincere vote of thanks for giving us the use of this excellent hall and for all their other kindness. This is, of course, a memorable

occasion, for possibly the Conference may never meet here again, seeing that we generally follow about our elder sister, the British Association. It is, therefore, a great occasion, but the President and Council of the Pharmaceutical Society have risen to its level.

The vote was passed unanimously.

Mr. T. H. HILLS: On the part of the Council and the members of the Pharmaceutical Society, I may say that they are most pleased to be able to afford you its rooms and to welcome you here. It has been a bright time for the Society to welcome the Conference—a time which perhaps none of us may live to see again. But I can only say, that should anything happen to prevent you carrying out your original design of going to the localities where the British Association meets, the Council and members of the Society will be only too glad to welcome you here.

Mr. GILES: It is now my pleasing duty and privilege to propose a resolution which will give the *coup de grâce* to this meeting. I am about to ask you who have sat with so much pleasure under the presidency of Mr. Groves to express to him, insufficiently as it must necessarily be in any words I can command, your great respect for him and your high appreciation of the excellent manner in which he has conducted the business of this Conference. We all know the high qualifications which he brings to the chair, and we have also seen that he has brought those smaller qualifications which are nevertheless important to the conduct of a meeting, and which have enabled this meeting to pass off, I venture to say, with great *éclat*. He has known how to sit still and graciously listen, and he has known how to give that fillip to the discussion which is occasionally necessary to keep it going. It has been to all of us a source of very great satisfaction to hear that he has consented again to fill the chair; it was a source of great anxiety to me to know what would be the result of the re-appointment of the officers, and whether we should again have the advantage of Mr. Groves's presidency. I am glad to find, however, that he has acceded to the wishes of those who must be allowed to know better than a single individual can what is best for the welfare of the Conference, and I am pleased to think that, when we in Bristol have the pleasure of entertaining the Conference to the best of our humble ability, it will be presided over by one whom we so highly regard and respect. I have to ask you to pass a cordial vote of thanks to the President for the able manner in which he has conducted the business of the Conference.

Mr. MACKAY, in seconding the motion, said, It is not necessary

that I should add anything to the clear, comprehensive, and truthful manner in which Mr. Giles has expressed himself in proposing this vote of thanks. Most truly we can all say, if ever there was the right man in the right place, Mr. Groves has been in that position. It is sometimes not an easy thing to gather up the reins of a series of meetings in connection with a scientific society, and it is yet more difficult to do so and guide with the reins the various forces as Mr. Groves has done during the last two days. That he has done so efficiently and well, we all know, and I especially coincide with what Mr. Giles has said with regard to the future, for I consider our Bristol friends are happy indeed in the prospect of Mr. Groves continuing to be President at the meeting there.

Professor BENTLEY: As the senior Vice-President, it devolves upon me to put this motion to the meeting, which I do most cordially, entirely endorsing everything which has been said by the proposer and seconder.

The resolution passed unanimously, and being briefly acknowledged by the President, the proceedings terminated.

EXHIBITION OF OBJECTS RELATING TO PHARMACY,
HELD IN LONDON, AUGUST, 1874,
DURING THE MEETING OF THE BRITISH PHARMA-
CEUTICAL CONFERENCE.

At the meeting of the Conference on Wednesday, August 5th, nine gentlemen were appointed as Committee to report upon the Exhibition: Messrs. Atherton, Barnes, Deane, Gale, Giles, Ince, Martindale, Stanford, Umney. From the manuscripts sent in by members of this Committee, the following alphabetical list of the exhibits has been compiled by the Assistant Secretary of the Conference under the direction of the Editor of the Transactions.

BAILDON, MR. H. C.

Specimens of Cortex Rhamni Frangulæ, and the preparations mentioned in his paper.

BAKER & Co., Messrs.

Microscope and Microscopic Slides.

BALCOMB, Mr., Cheltenham,

Exhibited Horsley's Graduated Tubes for Milk and Butter Testing by the Ether Process, as explained and illustrated by Mr. Stoddart at the Conference Meeting.

BARNETT & FOSTER, Messrs.

Improved Soda Water Bottles.

BENTLEY, Professor.

Leaf and Flower of *Victoria Regia*.

Products and Medicinal Preparations of *Eucalyptus Globulus*.

This series contained two fine plants of the *Eucalyptus Globulus*, as well as the Leaves, Bark, Essential Oil, and Stem of the same plant; the latter showing the solidity of the timber from the fully grown tree. Among the products of the family exhibited were Red Gum, Manna, Cigarettes, and Paper, made from four different species of *Eucalyptus*.

A large and interesting collection of Medicinal and Economic plants, including specimens of *Cinnamomum Zeylanicum*, *C. Cassia*, *Guaiaecum Officinale*, *Elettaria Cardamomum*, *Picræna Excelsa*, *Quassia Amara*, *Saccharum Officinarum*, etc., etc.

BROAD, Mr. JOHN M., Jun.,

Specimens of Syrup of the Phosphates. These were illustrative of a paper in the *Pharm. Journ.* (vol. iv., 3rd series, p. 849), and were prepared by methods there suggested.

Specimens of Poultrice Bags, having muslin on the side to be placed next the skin, and upon the outside gutta percha sheeting to prevent the surrounding clothes becoming damp.

BROWNING, Messrs.

Microscopes and Microscopic Slides.

BULLOCK & CRENSHAW, Messrs., Philadelphia.

Specimens of Sugar-coated Pills and Pilules. The latter containing each a fraction of a grain of such active medicines as Arsenic, Strychnia, and Podophyllin.

CLAYTON, Mr. F. C.

Collection of all the "only genuine" Eaux de Cologne, manufactured at Cologne (in number twenty-five).

CLIN & Co., Messrs., Paris,

Products of Eucalyptus Globulus, Monobromide of Camphor, various Dragées and Capsules.

CORBYN, STACEY & Co., Messrs.

A Double Valve Inhaler.

Phosphorus and Cod-Liver Oil Pêrles.

CORNÉLIS, M., Diest, Belgium,

Bottles with Desiccating Stoppers.

M. Cornélis makes use of the hollow stopper of an ordinary soda bottle by having it filled with pieces of quicklime, and the mouth tied over with a piece of leather; by this means the absorption of moisture by substances having a hygroscopic tendency is said to be prevented. Dried extracts and delicate flowers and leaves can thus be preserved. Samples of Violets, Red Rose Petals, and Bonjean's Ergotine, dried, were exhibited in them.

DARBY & GOSDEN, Messrs.

Specimens showing the proportion of matter utilised and wasted in the several methods of obtaining the soluble portions of meat.

DAVY, YATES & ROUTLEDGE, Messrs.

Specimens of Biniiodide of Mercury, Valerianate of Quinine, Benzoate of Ammonia, Citrate of Iron, Oleates of Mercury, and other chemicals.

DE RICQLE's, Messrs., Lyons,

stilled Essence of Peppermint.

ELLIS & Co., Messrs. R. J., Castle Street, Holborn,

Exhibited Patent Dropping and Sprinkling Stoppers for Medicines, Tinctures, Perfumes, etc. These resemble the ordinary cork-lined glass stopper used for sauces, etc., but a button-like enlargement is formed on the base of the glass portion, which permits this to be withdrawn only so far as to allow a flow of drops from between the glass stopper and the cork lining.

EVANS & LESCHER, Messrs.

Materia Medica Cabinet.

FRANCIS, Mr. G. B.

A living specimen of the Calabar Bean Plant.

GATCOMBE, Mr. J.

Specimens of Devonshire Seaweeds, including several rare species, as *Capomitra cabreræ*, *Gigartina pistillata*, *Chrysomenia rosea*, etc.

GILES, Mr. R. W., Clifton,

Exhibited specimens of liquid extracts of yellow Cinchona, Ergot, Senna, Black Alder Bark (*Rhamnus Frangula*), together with Compound Extract of Colocynth, Confection of Senna, etc., in illustration of his process of consecutive maceration (vide *Pharm. Journ.*, 3rd series, vol. iv., pp. 521). By this process syrup of senna can be prepared without the application of heat. Although the object of Mr. Giles's plan is limited to reducing to the minimum the deteriorating influence of evaporation by heat in effecting the exhaustion of ingredients by the minimum quantity of water, it does not appear to be impossible to prepare many liquid extracts and syrups without the application of heat at all. The confection of senna is said to be superior to that of the *Pharmacopœia*, because prepared by substituting the liquid extract for the powdered senna, avoiding thereby the grittiness which is so disagreeable to the sensitive patient.

GILLMAN, Mr. H.

Becker's Scientific and Chemical Balances.

GLADSTONE, Dr., F.R.S.

Photographs of fluorescent substances, showing that solutions of quinine, æsculin, etc., give figures as black as ink does, when photographed, and that figures drawn on paper with these solutions, although not visible to the eye, show black in a photograph.

GOOSEY & ROGERS, Messrs.

Marginal and Adhesive Plasters.

GRIFFIN & SON, Messrs. J. J.

Large and valuable set of Chemical Apparatus.

HAMPSON, Mr. R.

Specimens of Sugar-coated Pills.

HANBURY, D., Esq., F.R.S.

Copy of Portrait of Pier Andrea Mattioli, and an old Pharmacological Work of his.

HEARON, SQUIRE & FRANCIS, Messrs.,

Showed a sample of Benzoated Lard, which although it had been exhibited at the Conference Exhibition at Nottingham, in 1866, was still odorous and free from rancidity.

HILLS, T. H., Esq., F.L.S.

Landseer's Studies of Lions.

Sea Piece by Melly.

HOGG, Mr. R.

Mineral Water Stand.

HOPKIN & WILLIAMS, Messrs.

Rare Chemicals, including Methyl Strychnia, Methyl Atropia and Salts, Monobromocamphor, Double Cyanide of Potassium and Zinc, Sulpho-carbolate and Permanganate of Zinc, redistilled Chloral Hydrate and Croton Chloral Hydrate, Nitrate and Nitrite of Amyl, Trimethylamine, pure Aldehyde, specimens of Oleate of Mercury containing 5, 10, and 20 per cent. of Oxide respectively.

HOWARD, J. C., Esq., F.L.S.

A series of twenty-four rare cinchona products. Sulphate of Amorphous Quinine, prepared by Dr. de Vrij's process.

HOWDEN, Mr.,

Exhibited an improvement in Dispensers' Scales.

INDIARUBBER, GUTTA PERCHA, AND TELEGRAPH WORKS COMPANY.

Specimens of Telegraph Cable, Medical and other Batteries, Ebonite Manufactures, etc.

JACKSON, Mr. M.

Chemical and Electrical Apparatus, and pure Chemicals for Analytical Purposes.

Apparatus for Pharmaceutical Students.

Wine Testing Apparatus applicable to Pharmaceutical purposes.

JACKSON & GRAHAM, Messrs.

Antique and Japanese Bronzes.

KIRBY, Messrs. T. & H.

Samples of Pearl and other Coated Pills, and of their Glycecols (a new and elegant form of lozenge, having a basis of glycerin and isinglass, or some form of gelatine).

Portable Medicine Chests of a convenient size for the great-coat pocket, and containing Coated Pills of the more important drugs as well as a few useful Surgical Appliances.

Specimens of Gelatinous Capsules, containing liquid or solid veterinary medicines.

LEAROYD, Mr. E. R.

A Suppository Bath, a small Tin Water Bottle for use in melting the bases in making Suppositories, Pessaries, and small quantities of ointments.

LOCKYER, J. NORMAN, Esq., F.R.S.,

Photographs of Solar Spectra, enlarged by Negretti & Zambra.

LYNCH, & Co., Messrs.

Root Cutter, Portable Water-Bath, and various novelties and improvements in Druggists' Sundries.

Double Action Tincture Press.

MALDINE, M.

Specimens of Gazogenes.

MEGGESON & Co., Messrs.

Lozenges of the Bristol Pharmacopœia.

Lozenges of the Throat Hospital (including lozenges of Benzoin, Guaiacum, Logwood, Cream of Tartar, Carbolic Acid, and Cubebs).

MORSON & SON, Messrs.

Alkaloids and rare Chemicals (including specimens of Narceia, Podophyllin, Thymic Acid, Crystallized Hydrochlorate of Morphia, Aconitine, and Glacial Phosphoric Acid).

A series of Opiums from different sources (including samples of the English and Australian products).

A Chinese Opium-Smoking Apparatus.

A picture of a Laboratory, by Muller.

NIVEN, Mr. R.

Castor-Oil Jelly, in which it was stated the taste of Castor Oil could not be perceived.

PARKES, Dr. E. A.

Parkes' Chemical Cabinet for the Analysis of Food, Air, Water, etc.

PINDAR & Co., Messrs.

Rotary Pill Machine, worked by hand or treadle, with improved presses for piping the pill-mass, by which it is said that from ten to thirty pounds of pills can be made in an hour.

Double Action Tincture Press.

REYNOLDS, Mr. R.

Photograph of the house in which Priestley was born.

RICHARDSON, JOHN, & Co., Messrs., Leicester.

Specimens of Soluble Pearl-Coated Pills, Syrup of Croton Chloral, and other preparations.

ROBERTS, Mr. W. C., Chemist to the Mint.

Specimen of Crystallized Gold.

ROBERTS & Co., Messrs., Paris.

Improved Enemas, Wafer Envelopes (containing Medicinal Powders), "Precision" Drop Tubes of Limousin, Dragees.

Goudronière, or apparatus, for diffusing the odour of tar. This consists of about six metallic perforated plates immersed in a metallic box half full of tar, the plates being attached to the lid of the box; when the lid is raised, it is supported by a spring, and the plates then expose the tar on their surface to the action of the air.

SCHMEDES, Messrs.

Specimens of Sarg's Pure Glycerin, and Crystalline Glycerin (the heat of the room prevented the latter from assuming its normal condition).

SHEPHERD, Mr.

Self-acting Label Cabinets for preserving labels ready for use, and keeping them clean.

SILVERLOCK, & Co., Messrs.

Specimens of Labels, etc.

SMITH & BECK, Messrs.

Microscopes and Microscopic Slides.

SMITH, Messrs. T. & H.

Specimens of Tela Vesicatoria, Cantharidine, Cryptopia, Meconine, and other preparations.

SOUTHALL & Co., Messrs., Birmingham.

Students' Materia Medica Collection.

Analyzed Drugs, Standardized Powdered Extracts, and other Pharmaceutical preparations, including Quinovia Cocoa and Chocolate, and Quinovia Chocolate Lozenges.

STEWART, J. H., & Co., Messrs.

Microscopes and Microscopic Slides.

SYMONS, Mr. G. J.

Series of Thermometers employed in experiments to ascertain—(1) relative sensitiveness of Mercurial and Alcohol Thermometers; (2) whether increase of sensitiveness with decrease of size of bulb follows any regular law; (3) if so, whether it is similar for Mercurial and Alcohol Thermometers; (4) to test the sensitiveness of the new Bifurcated and Hollow-Cylindereed Thermometers.

TENNANT, Professor:

Models of Crystals.

Minerals found with South African Diamonds.

Large Cape Diamond.

TILSLEY & SPILLER, Messrs.

Tilsley's compound Pendulum Apparatus.

VOKINS, Messrs.

"Oak Tree Ford," and other pictures.

WILDMAN WHITEHOUSE & LATIMER CLARK.

Electrical Recorder for Registering Time, Speed, Distance Run, and Number of Passengers Inside and Out in Tram-cars and Omnibuses.

YARDE, Messrs., & SON.

Show-Glass for Shop-Window.

Beautiful Shifting Sublimate of Iodide of Cyanogen.

ZIMMERMANN, Messrs. A. & M.

Beindorff's Steam Apparatus for Pharmaceutical Laboratories.
Electrical Apparatus.

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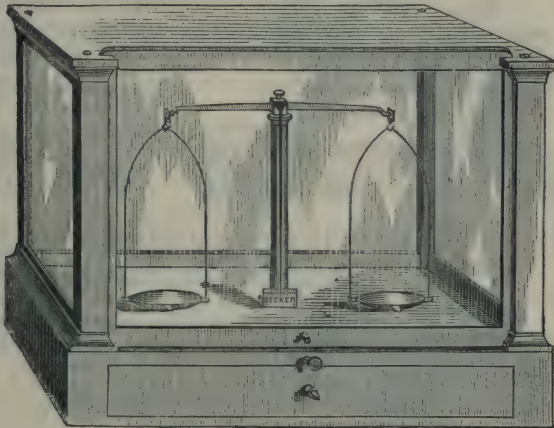
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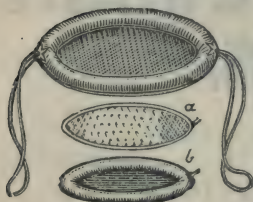
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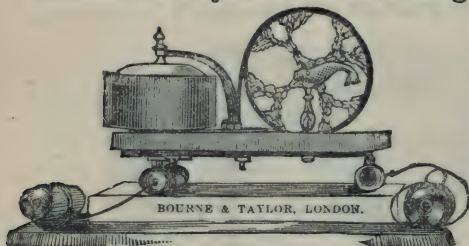
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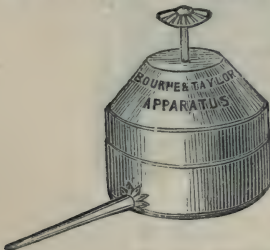
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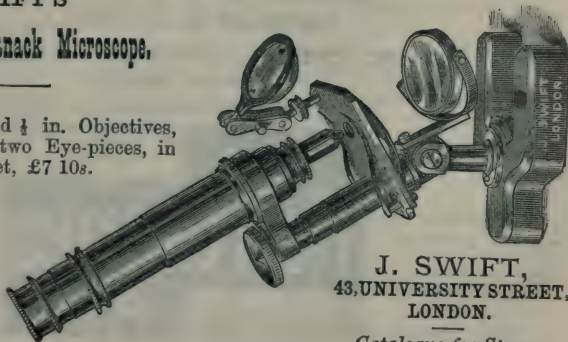
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SULPHINE is the most important discovery in medicine that has been made for many years. It is a clear and colourless liquid possessing very remarkable therapeutical properties.

SULPHINE strikes at the root of numerous diseases, by destroying the germs which enter the system along with the food we eat, the beverages we drink, and the air we breathe.

SULPHINE purifies the blood from these sources of disease, by destroying the germs, or animated cells, which are carried by the circulation to every part of the system, and which propagate with amazing rapidity: it renders all the secretions healthy.

SULPHINE also stops fermentation and prevents putrefaction: it is a powerful disinfectant, and arrests the progress of all epidemics and contagious disorders. It is antagonistic to cholera, typhus, measles, scarlet fever, small-pox, and all *Zymotic* diseases.

SULPHINE, by regulating the fermentation of the food in the digestive organs, is an immediate cure for flatulence and indigestion. It is a specific for chronic dyspepsia, and strikes at the root of all those evils which follow in its train—headache, heartburn, nausea, constipation, debility, etc. By this action it allows time for the food to become properly dissolved by the gastric juice.

Price 1s. and 2s. per Bottle.

Extract from Letter of M. THOMAS SUTTON, B.A., Cantab.—“It gives me much pleasure to be able to testify to the merits of *Sulphine* as a cure for indigestion. I had been for three years a martyr to that complaint.”

From Frère ARNOULDT, of Redon, France.—“Your *Sulphine* has, after a few days, freed me from all painful sensations, and I certainly regained my strength as by enchantment.”

Numerous other Testimonials on application.

* * * **“INDIGESTION CURED BY SULPHINE.”**

Price 2d., by post 3d. W. PARKE, High Street, Wolverhampton.

BAILEY'S CONCENTRATED FLUID MAGNESIA,

Prepared with great care, and strongly recommended by the Faculty for removing Bile, Acidities, and Indigestion, restoring Appetite, preserving a regular action of the bowels, and dissolving uric acid in Gravel and Gout; also as an easy remedy for Sea Sickness, and for all the febrile affections incident to childhood it is invaluable; moreover it is especially valuable as a specific for Heartburn and Spasm. On the value of Magnesia as a remedial agent it is unnecessary to enlarge; but this Fluid Preparation is the most valued by the profession, as it entirely avoids the possibility of those dangerous concretions usually resulting from the use of the article in powder.

In Bottles, 1s. and 2s. 6d. each.

Particularly adapted for Exportation, as it will keep good for any length of time, and in every climate; also put up in half-gallon and gallon bottles, for the use of Hospitals, Dispensaries, and Compounding Prescriptions, at 5s. and 9s. each.

THE ACIDULATED SYRUP,

For use in conjunction with the Fluid Magnesia. In bottles, 1s. each.

DR. J. COLLIS BROWNE'S CHLORODYNE.

IMPORTANT CAUTIONS

From Lord Chancellor SELBORNE,
Vice-Chancellor Sir W. PAGE WOOD, and the
Lords Justices of Appeal.

VICE-CHANCELLOR SIR W. PAGE WOOD, by whom the suit in Chancery was first heard, stated in his judgment that "Dr. J. Collis Browne was undoubtedly the Inventor of Chlorodyne, that the whole story of the defendant Freeman was as deliberately untrue as the falsehood he had deposed to with reference to the use of his Chlorodyne in the hospital."

THE VICE-CHANCELLOR also stated "that Chlorodyne was a fanciful name, and had application been made sooner, the Court would have given Dr. Browne protection."

LORD CHANCELLOR SELBORNE coincided with the judgment of the Vice-Chancellor upon this point, and stated "that had application been made at a proper time and place, the Court would have found means to restrain the Defendant from misrepresenting the decision of the Vice-Chancellor."

LORD JUSTICE JAMES, on appeal, stated in his judgment, "that the Defendant Freeman had made a deliberate misrepresentation of the decision of Vice-Chancellor Wood."

It was proved in court, on affidavit by Mrs. Forbes, of Paris, that the testimonial published in the "Times," November 14th, 1865, speaking of the great efficacy of Chlorodyne in Cholera, referred to Dr. J. Collis Browne's Chlorodyne, and that she never used any other, that she had written to the Defendant Freeman to that effect; notwithstanding which notice the Defendant publishes the said testimonial as referring to his medicine.

The Editor of the "Medical Times and Gazette," in his report on Chlorodyne, January 13th, 1866, gives information that the Chlorodyne referred to was the medicine introduced by a retired Army Medical Officer, which was Dr. J. Collis Browne. Still this is published by the Defendant as testimony to his medicine.

Numerous affidavits from eminent Physicians and others were produced in Court, stating that Dr. J. Collis Browne was the inventor of Chlorodyne, and that when prescribing they mean no other.

The Defendant himself publishes that his compound is in effect and composition quite different to any other preparation; nevertheless he assumes the name, testimonials, etc., of Chlorodyne.

The following eminent firms stated on affidavit that Dr. J. Collis Browne was the discoverer of Chlorodyne, and that they always supplied the preparation as the Original Chlorodyne, or when Chlorodyne was asked for—

THE APOTHECARIES' HALL, LONDON.
Messrs. Allen & Hanbury.
" John Bell & Co.
" Baron & Harvey.
" Burgoyne & Burbidge.

Messrs. Cox & Gould.
" Corby & Co.
" Evans & Lescher.
" Morson & Son.
" Savory & Moore.

Sold in Bottles—1s. 1½d., 2s. 9d., 4s. 6d., and 11s. Usual Discount to the Profession.

SOLE MANUFACTURER,

J. T. DAVENPORT, Pharmaceutist,
33, GREAT RUSSELL STREET, BLOOMSBURY SQUARE, LONDON.

GEO. CURLING & CO.,
WHOLESALE DRUGGISTS

AND

General Agents,

30, ST. MARY AXE, LONDON,

Execute with the utmost promptitude, orders confided to their care from
INDIA, CHINA, AUSTRALIA, THE COLONIES, AND
ALL PARTS OF THE WORLD.

DRUGS & CHEMICALS.

CHEMICALS OF RECENT DISCOVERY AND PHOTOGRAPHIC CHEMICALS,

EFFERVESCENT CITRATE of MAGNESIA,

Cod Liver Oil and Castor Oil in Bottles,

Capsules of Copaiba, Castor Oil, Cubebs, and Cod Liver Oil,

LOZENGES, CONFECTIONERY, PERFUMERY,

MEDICAL GLASS,

ENEMAS, SURGICAL INSTRUMENTS, TRUSSES,

AND ALL ARTICLES REQUIRED BY

CHEMISTS, DRUGGISTS, AND SURGEONS.

Price Currents forwarded regularly.

HUBBUCK'S PURE OXIDE OF ZINC.

PHARMACEUTICAL CHEMISTS will use this in preference to the ZINCI OXIDUM of the Br. Ph. 1867, which is a roasted Carbonate, forming an impure Hydrate instead of a pure Oxide.

HUBBUCK'S PURE OXIDE is made by sublimation, and is warranted to contain 99.5 per cent of Pure Oxide.

*Extract from "Pharmaceutical Journal" of May 1, 1856,
page 486.*

TRANSACTIONS OF THE PHARMACEUTICAL SOCIETY OF LONDON,
Wednesday, April 2nd, 1856.

"On Pure Oxide of Zinc for Use in Medicine."

"Mr. REDWOOD directed the attention of the meeting to the very beautiful specimen of oxide of zinc on the table, which had been presented by the manufacturer, Mr. Hubbuck. Some of this oxide has been submitted to him for chemical examination, and finding it to be remarkably pure, and to possess in a high degree all the chemical and physical qualities required in oxide of zinc intended for use in medicine, he had suggested to Mr. Hubbuck that it might be brought under the notice of the Society.

"The specimen of oxide of zinc on the table was not only free from all impurities, but it possessed the other qualities required. It was a perfectly white, light, and smooth powder.

"Mr. HUBBUCK stated that the oxide of zinc which his firm made for use in medicine was free from impurities commonly occurring in the oxide made by combustion. The zinc was first thoroughly refined, and all the lead, arsenic, cadmium, iron, and other impurities removed. The pure oxide was then produced by combustion, abstracting only the very finest part of the product for medicinal purposes. About one-tenth or one-twelfth of the whole was thus set apart in producing that from which the sample exhibited has been taken; and this could be done, since their usual operations requiring them to make several tons of oxide every day, they could separate as much as was required in a state of absolute purity, while the remainder would be equally valuable as a pigment.

"The CHAIRMAN thought the mechanical condition of substances used in medicine was often a matter of considerable importance, and ought to be considered as well as their chemical composition. He thought the specimen before the meeting was a very perfect one in every respect, and he had no doubt it was the sort of oxide of zinc best adapted for use in medicine."

*To be had of all Wholesale Druggists, in boxes of 7 lbs. and 14 lbs.
each, Stamped by the Manufacturers.*

The Manufacturers supply, Wholesale only, in quantities of not less than a Quarter of a Ton.

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T. MORSON AND SON,

31, 33, and 124, SOUTHAMPTON ROW, RUSSELL SQUARE, W.C.

Works: HORNEY RD., N., & SUMMERFIELD WORKS, HOMERTON, E., LONDON.

MANUFACTURERS OF PURE CHEMICALS AND ALL NEW MEDICINES.

JUROR 1862. SILVER MEDAL AWARDED, PARIS 1867.

PREPARATIONS OF PEPSINE.

MORSON'S PEPSINA PORCI,

OR,

Pepsine obtained from the stomach of the Pig, in a pure and palatable form.

Free from Starch and Acid.

Dose, 2 to 4 grains.

MORSON'S MEDICINAL PEPSINE.

Or, Digestive Powder.

(*Pepsine Acide Amylacée, ou Poudre Nutritive.*)
Contains the active digestive principles of the gastric juice of the stomach, purified and rendered permanent and palatable.

Dose, 10 to 20 grains.

CAUTION.—As many of the low-priced Pepsines of commerce possess little or none of the digestive properties of **True Pepsine**, the following tests of the purity and activity of the above preparations are given, and every bottle bearing the trade mark of T. Morson & Son is guaranteed to answer the tests indicated.

TEST.—**TESTS OF DIGESTIVE POWER OF TRUE PEPSINE.**—Mix 2 grains Pepsina Porci or 6 grains of Medicinal Pepsine, with an ounce of water, then add 15 drops of Hydrochloric Acid and 120 grains of coagulated egg Albumen (hard boiled white of egg). Apply a gentle heat, not exceeding 100 degrees Fahr., (the temperature of the stomach), for about half-an-hour, stirring the mixture occasionally, when the process of digestion will be found to have commenced, the Albumen becoming soft and pulpy. This action may be continued until, after the lapse of a few hours, a solution is effected, such as occurs in the stomach.

PEPSINE WINE.

The efficacious properties of this preparation are already well-known; when the digestive organs are weak, or their secretions imperfect or unhealthy, it has been found invaluable.

Sold in Bottles, at 3s., 5s., and 9s. each.

PEPSINE GLOBULES.

One or two for a dose. These, like the Lozenges, may be carried in the pocket and taken when required.

Sold in Bottles at 2s., 3s. 6d., and 6s. 6d. each.

PEPSINE LOZENGES.

Each Lozenge contains a dose of Pepsine, and will be found a very convenient and agreeable mode of taking this remedy, as it may be carried in the pocket, and taken when dining out, or at any other time, without observation.

Sold in Boxes, at 2s. 6d., and 4s. 6d.

These Preparations bearing our trade mark, BUT NOT OTHERWISE, will be guaranteed to possess the full efficacy of the digestive principle.

MORSON'S PANCREATINE PREPARATIONS.

PANCREATINE EMULSION, (SUBSTITUTE FOR COD LIVER OIL.)

Perfectly miscible in water or milk.

Dose, 1 to 3 teaspoonful twice a day in milk or water.

Sold in stoppered Bottles, at 2s. 6d., 4s. 6d., & 7s. 6d. each.

PANCREATIZED

COD LIVER OIL.

In Bottles.

2s. 6d., 4s. 6d., and 7s. 6d.

PANCREATINE POWDER.

Containing the active principle obtained from the Pancreas by which the digestion and assimilation of fat is effected.

Dose, 20 to 30 grains.

GELATINE.

A perfect and economical substitute for Isinglass.

In packets, 6d., 1s., and 1s. 6d. each.

SACCHARATED WHEAT PHOSPHATES.

A valuable dietetic preparation for Invalids and Children, supplying the elements for the formation of bone.

In 4, 8, and 16 oz. bottles.

CREOSOTE.

Caution.—From Wood Tar.

Test of Freedom from Carbolic Acid.

Insoluble in Price's Glycerine.

ARTIFICIAL ESSENCES FOR FLAVOURING.

CHLORODYNE

Has now obtained such universal celebrity as a remedial agent, it can scarcely be considered a speciality, its essential composition being known to most European practitioners. Many of the Chlorodynes of commerce are not of uniform strength, and vary in their effects, which has induced MORSON & SON to compound this preparation to remedy these defects. The Dose for an adult is 10 to 20 drops (and one minim is equal to 2 drops). The dose may however, be increased in especial cases to 25 or even 30 minims, but it is best to commence with the lesser dose. It may be administered in almost any fluid or on sugar.

Sold in Bottles 1s., 2s. 6d., and 4s., and in bulk for Dispensing.

Morson's Preparations are sold by all Chemists and Druggists throughout the World.

LIQUOR FERRI CHLOROXYDI. SQUIRE.

Is a solution of Oxide of Iron, of the same strength of Iron as Liquor Ferri Perchloridi, Brit. Pharm.
Dose, 5 to 20 minims in water.

PARRISH'S CHEMICAL FOOD. SQUIRE.

As prepared by PARRISH, of Philadelphia.

For convenience and security, this preparation is supplied in 4 or 8 oz. and 1 lb. bottles. Each bottle bears the name "SQUIRE," on the seal and label.

PEPSINE, BRIT. PHARM. SQUIRE.

HOTTOT BOUDAULT has prepared specially for P. & P. W. SQUIRE, a Pepsine containing neither Starch nor Sugar of Milk, which answers the tests of the British Pharmacoposia, and keeps perfectly.

Dose, 2 to 5 grains.

P. & P. W. SQUIRE, 277, OXFORD STREET, LONDON.

SULPHO-CARBOLATES.

Soda, Zinc, Lime, Iron, Ammonia, Potash, Magnesia.

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205, ST. JOHN STREET ROAD, LONDON, E.C.

ALFRED ALLCHIN'S PHARMACEUTICAL PREPARATIONS.

Smelling Salts.—The MONOCARBONATE OF AMMONIA manufactured by ALFRED ALLCHIN is the Neutral Salt so much valued for the preparation of Smelling Salts. It retains its pungency as long as any salt remains. 1 lb. bottles, 2s. 8d. each.

Liq. Ammon. Odorif., or VOLATILE ESS.: for Allchin's Ammon. Monocarb. In stoppered bottles, 4 oz., at 1s. 8d.; 8 oz., 3s. each.

Pungents, with handsome Cut Stoppers, filled with Allchin's Smelling Salts, 8s. per dozen.

Ol. Rosæ Concent.—One ounce of this Concentrated Solution of Anchusine, mixed with two pounds of Oil, will give it the usual colour; it is also admirably adapted for colouring Pomades, Lip-Salve, Camphor Balls, etc. 4s. per lb.

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To be had of all the Wholesale Houses.

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SYRUP. SENNÆ CONCENT., FREEMAN.

Dr. J. POWER, of Abingdon Street, says:—"I am happy in again bearing testimony to the value of your excellent SWEET ESSENCE OF SENNA, with respect to which my experience has assured me of the absence of griping and nauseating properties,—its pure and unadulterated preparation containing, within a comparatively small bulk, the whole of the essential principle of that valuable Medicine, together with the fact of its being so efficacious as in my opinion to supersede, in a majority of cases, the use of those violent and drastic purgatives Calomel, Aloes, and Jalap."

May be obtained through any Wholesale House, in $\frac{1}{2}$ lb., 1 lb., and 2 lb. Bottles for dispensing, and in the usual sizes for Retail.

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In this preparation the therapeutic and alimentary properties of Cod Liver Oil are increased.

It is pleasant to the taste. The most delicate Stomach can retain it. Strongly recommended by the Faculty.

IN BOTTLES, 1s. 1 $\frac{1}{2}$ d. and 2s. 9d.

Prepared only by FULLER & Co., Norwich.

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BRITISH PHARMACOPŒIA,
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Beg to direct attention to the experiments upon Medical Pepsin, by Professor Tuson, recorded in the *Lancet*, Aug. 13, 1870, and in the *Pharmaceutical Journal*, Aug. 20, 1870, which incontestably prove the very great superiority of their preparation in point of digestive power over every other Pepsin, British or Foreign.

DOSE: TWO TO FOUR GRAINS.

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PILLS of the Pharmacopœias, Hospitals, Private
Formulæ, and of any prescription, prepared with
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The TASTELESS PILLS have a soluble, pearly,
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MACKEY'S ABSORBENT FLOCKS for Suppurating
Wounds, 2s. 6d. per lb. It sucks up the thin acrid se-
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THE NEW PLIABLE ADHESIVE PLASTERS.

Orders by post will receive prompt and careful attention.

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WHOLESALE AND EXPORT DRUGGISTS.

Established 1832.

Chemical Food, or Parrish's Syrup.

* * Each teaspoonful contains 2 grains of Phosphate of Iron and Lime, with smaller proportions of the Alkaline Phosphates, all in perfect solution. One or two teaspoonfuls at mealtime.

Syrup of Biphosphate of Iron and Mangane.

Syrup of Biphosphate of Iron.

Syrup of Biphosphate of Lime.

Syrup of Biphosphate of Zinc.

Syrup of Hypophosphite of Iron, Quinine, and Strychnine.

Syrup of the Superphosphate of Iron, Quinine, and Strychnine.

Syrup of Hypophosphite of Iron.

Syrup of Hypophosphite of Lime.

Syrup of Hypophosphite of Soda.

Compound Syrup of Hypophosphite of Iron and Lime.

Syrup of Pyrophosphate of Iron.

Syrup of Bromide of Iron.

Syrup of Iodide of Quinine.

Syrup of Iodide of Iron and Quinine.

Syrup of Peracetate of Iron and Quinine.

Solution of Peracetate of Iron.

Do. Glacial.

Clinical experience has proved that this preparation contains Iron in the most assimilable form.

Solution of Peracetate of Iron and Quinine.

COD LIVER OLEIN.

This preparation, is prepared from the finest Newfoundland Oil, containing all the active principles, without its impurities, and will be found to agree with the most delicate stomachs.

Phosphorised Cod Liver Olein.

Cod Liver Oil with Quinine.

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SYRUP OF HYPOPHOSPHITE OF IRON AND QUININE.

This preparation has been successfully given in Hysteria, Epilepsy, Spermatorrhœa, and other exhaustive derangements of the Nervous System.

Proprietors of the City of London Cough Lozenges and Pills, Toothache Annihilator and Antiseptic Saline.

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An Effectual Application for removing Corns and Warts, &c.
Retail, 6d. each.

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IS SPECIALLY RECOMMENDED FOR USE BY
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For Deodorising and Disinfecting.

Recommended by the Medical Profession for the last
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METHYLENE (Bichloride)

Discovered to be a general ANÆSTHETIC by DR. RICHARDSON, in 1867,
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Experience has proved it to be safer, and in every respect better, than
Chloroform. 1 lb. Bottles, 16s.; 8 oz. 8s. 6d.; 4 oz. 4s. 6d.; 2 oz. 2s. 6d.

COMPOUND ANÆSTHETIC ETHER,
For producing LOCAL ANÆSTHESIA.

In 4 oz., 10 oz., and 20 oz. bottles, 2s., 4s., and 7s.

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For promoting the Healing of Wounds by the first intention, for treating Open or
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PEROXIDE OF HYDROGEN. (10 Volumes.)

CHARCOAL CAPSULES,
Containing pure Vegetable Ivory Char-
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Always Secures

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And the Comfort of the Wearer.

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Blatchley's Celebrated Bran and Almond Biscuits are free from starch and sugar, and recommended by the profession in all cases of Diabetes. The Bran, price 1s. 6d. per lb., or in boxes at 5s., 10s., and 20s.; the Almond, 2s. 6d. per lb. Also, the Prepared BRAN POWDER, and GLUTEN BREAD and BISCUITS. "The great value of Bran Cake, as a substitute for Bread, has now been established by the experience of so many individuals that no argument is needed in its favour."—Dr. Camplin, "On Diabetes," 2nd edition, page 78.—E. BLATCHLEY supplies all the Hospitals in England. 362, OXFORD STREET. Established 1838.

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DAVID SMITH KIDD,

Licensed Maker of Methylated Spirits of Wine.

COMMERCIAL STREET, SHOREDITCH, LONDON, N.E.

All Spirits warranted made purely from Grain, and 65 O.P.



Are warranted not to contain a single particle of MERCURY or any other MINERAL SUBSTANCE, but to consist entirely of Medicinal Matters, PURELY VEGETABLE.

For nearly forty years they have proved their value in thousands of instances in diseases of the HEAD, CHEST, BOWELS, LIVER, and KIDNEYS; and in all Skin Complaints are one of the BEST MEDICINES KNOWN.

Sold Wholesale and Retail, in Boxes, price 7½d., 1s. 1½d., and 2s. 9d. each, by

G. WHELPTON & SON,

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And may be had of all Chemists and Medicine Vendors. Sent free on receipt of 8, 14, or 38 Stamps.

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THE ORIGINAL MANUFACTURERS OF

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FOR MEDICINAL PURPOSES,

Have all other qualities in Stock, to suit the requirements of
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DO NOT LET YOUR CHILD DIE!

**FENNINGS' CHILDREN'S POWDERS PREVENT CONVULSIONS,
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For Children Cutting their Teeth, to prevent Convulsions.

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Chemists can obtain FENNINGS' EVERY MOTHER'S BOOK, for Counter Distribution, free of charge, by applying to the Patent Medicine Houses, or Wholesale Chemists.

DR. C. R. COFFIN'S AMERICAN DENTIFRICE.

Prepared only by **WILLIAM DARLING**, Chemist, Manchester.

May be had from **S. MAW, SON & THOMPSON; BARCLAY & SONS;**
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Price 2s. per box, and family jars, 10s. each.

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OILS, SEEDS, &c.,

Of the **FINEST DESCRIPTION**, at very reasonable Prices, write to

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Samples carriage paid. All orders over £5 delivered free.

FRED. LEWIS'S ELECTRIC OIL

Contains no lead or other metals, neither is it perfumed with essential oils. It contains all the stimulants recommended by Professor Cameron and other authorities on the hair, and when once used recommends itself.

Price 2s. 6d. and 3s. 6d. per Bottle,

At 6, FLEET STREET, DUBLIN,
AND RESPECTABLE VENDORS IN PERFUMERY.

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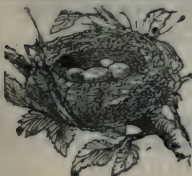
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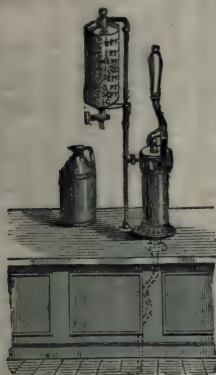
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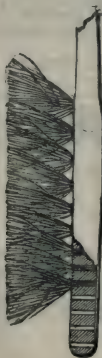
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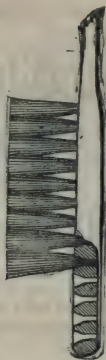
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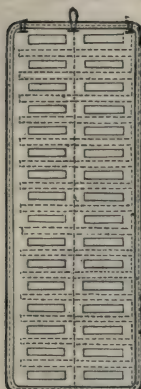
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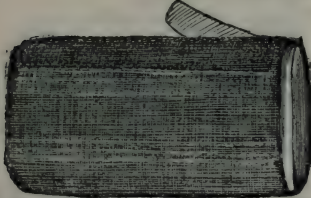
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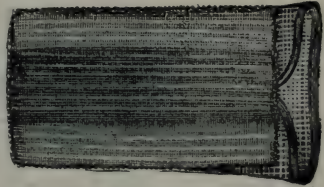
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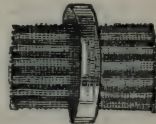
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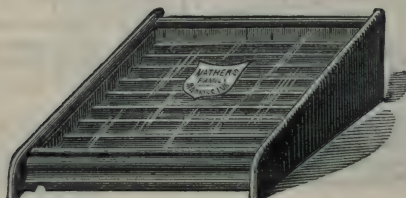
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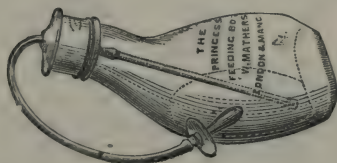
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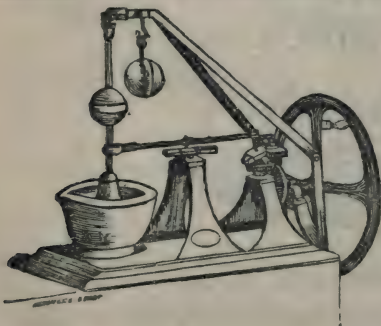
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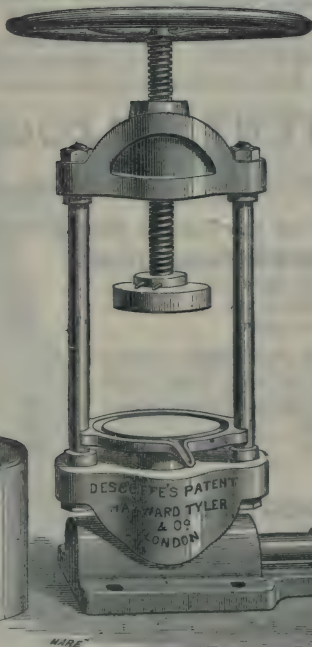
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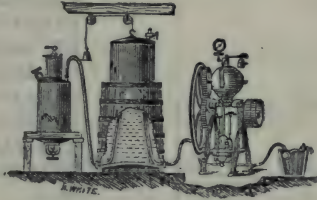


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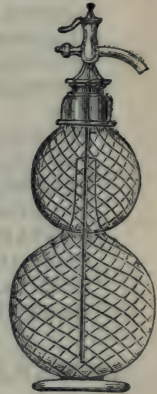
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CARLSBAD	Alkaline and slightly Purgative	11/-	10/-	...	44/-	40/-	38/-
CONDILLAC	Sulphureous ...	11/-	42/-
CONTEXEVILLE	Alkaline, and slightly Purgative (in cases of 60 quarts)	6/-	25/-
ENS	Alkaline ...	10/-	40/-
ENGHIEN	Do.	8/-	30/-
EVIAN	Sulphureous ...	10/-	48/-
FACHINGEN	Alkaline ...	12/-	23/-	16/-	...
FRIEDRICHSHALL	Acidulated, Gaseous ...	6/-	4/-	...	28/-	38/-	...
HOMBURG	Saline, Aperient (in cases of 30 quarts and 60 pints)	12/-	8/-	...	40/-	32/-	...
HUNYADI JÁNOS BITTERQUELLE	Alkaline, Purgative ...	10/-	8/-	...	54/-	40/-	...
KESSEGEN	Saline, Aperient ...	14/-	10/-	...	46/-	34/-	...
KREUZNACH	Alkaline, Gaseous...	11/6	8/6	...	58/-
MARIENBAD	Iodized ...	12/-	10/-	...	54/-	40/-	...
OREZZA	Alkaline, Purgative ...	13/6	28/-
POUGUES	Ferruginous (in cases of 30 quarts)	9/-	36/-
PULNA	Alkaline ...	14/-	10/-	...	40/-	25/-	...
SAINT MORITZ	Saline, Purgative (in cases of 40 quarts and 40 pints)	13/-	9/-	...	52/-	36/-	...
SARATOGA, CONGRESS	Ferruginous	12/-	...	47/-	47/-	...
Do. EMPIRE	Alkaline, Gaseous, Aperient (in cases of 48 pints)	...	11/-	43/-	...
SCHWABACH	Do. Iodized (in cases of 48)	8/-	30/-	32/-	28/-
SCHWABHEIM	Ferruginous ...	9/-	...	7/-	36/-	32/-	...
SELZER	Acidulated, Gaseous ...	6/-	4/-	...	23/-	16/-	...
SOULZMATT	Do. do.	7/-	28/-
SPA	Do. Ferruginous ...	10/-	9/-	...	40/-	43/-	...
VALS	Alkaline, Gaseous, Ferruginous	9/-	33/-
VICHY	Alkaline, Gaseous...	9/-	8/-	...	33/6	...	28/6

THE LEAMINGTON APNEUMATIC MINERAL WATERS.

From "The Chemist and Druggist," March 14, 1874.

"Before charging the Water, K. and Co. collect it in silver-lined cylinders, and by pneumatic pumps exhaust it of all previously contained air or gases. Manifestly the Waters thus manipulated will contain only the carbonic acid gas expressly pumped into them; and it is equally evident that an equal pressure will by this means indicate a larger proportion of gas."

From "The Chemists' and Druggists' Advocate," March 20th, 1874.

"The Apneumatic process of Kinmond & Co. is declared to effectually secure the purity and quality of Aërated Waters, and is considered to be the most important improvement in the manufacture of Aërated Waters within the last thirty years."

Apneumatic Soda Water.
Apneumatic Brighton Seltzer.
Apneumatic Potass Water.
Apneumatic Lithia Water.
Apneumatic Aërated Water.
Lemonade.

SPURIOUS IMITATIONS.

Before Vice-Chancellor Malins.

A perpetual Injunction was awarded on the 22nd January, 1874, against James Daily, 4, GRAND PARADE, LEAMINGTON, restraining him from selling Mineral Waters as being of Kinmond & Co.'s manufacture, the same not being of their manufacture. J. Daily was ordered to pay the costs of this suit.

Sold by all respectable Chemists, Wine Merchants, and Hotel Keepers, and at the

MANUFACTORY, KENILWORTH STREET.

Kinmond & Co.,

(Late J. Daily & Co.), Leamington.

Descriptive Pamphlet of the Apneumatic Process free on application.

Terms—Net.
Quarterly Account. }

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From 35, Bucklersbury. **INGRAM & CO.,** 35, Bucklersbury.
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Counting-house Entrance :—BENNETT'S HILL, QUEEN VICTORIA STREET.

Price List of Foreign Natural Mineral Waters, &c.

NAME.	PROPERTIES.	TRADE PRICES.			
		Per Dozen.		Per Orig. Pkg.	
		Qts.	Pts.	Qts.	Pts.
Adelheidsquelle	Iodized.....	12/	...	...	...
Aix-la-Chapelle	Sulphurous.....	18/	16/	72/	64/
Apollinaris (Hmprs. of 50 ea.)	Acidulated, Gaseous ...	6/	4/6	22/	17/6
Do. (in Case)	Do.	6/	4/6	23/	37/
Bareges	Sulphurous.....	12/	9/	48/	36/
Birmenstorf.....	Alkaline.....	12/	...	48/	...
Bonnes	Sulphurous.....	13/	9/	53/	37/6
Bourboule, La	Saline	12/	...	48/	...
Bussang	Alkaline.....	7/	...	28/	...
Carlsbad	Do. & Purgative... 11/	...	...	42/	...
Condillac	Do.	6/	...	25/	...
Contrexeville.....	Do.	10/	...	40/	...
Ems	Do.	8/	...	30/	...
Enghien	Sulphurous.....	10/	...	40/	...
Fachingen.....	Acidulated, Gaseous ...	6/	4/	23/	16/
*Friedrichshall	Saline, Aperient	12/	8/	*28/	*38/
*Giesshübler	Alkaline, Ferruginous..	11/	8/	*21/	*32/
*Harrogate	Sulphurous.....	7/	...	*20/	...
Homburg	Saline, Gaseous.....	10/	8/	40/	32/
*Hunyadi-Janos.....	Do. Aperient.....	14/	10/	*27/	40/
Kissengen	Alkaline, Gaseous	11/6	8/6	46/	34/
Krankenheil	Iodized	14/	...	54/	...
*Kreuznach	Do.	10/	...	*24/	...
Lardy	Ferruginous	9/	...	35/	...
Marienbad	Alkaline, Purgative	13/6	10/	54/	40/
*Missisquoi.....	No Analysis given	25/	...	*50/	...
*Orezza	Ferruginous	12/	...	*28/	...
Plombières	Alkaline.....	9/	...	36/	...
Pougues	Do.	9/	...	36/	...
*Pulna	Saline, Purgative.....	14/	10/	*40/	*28/
Pymont.....	Ferruginous.....	14/	...	52/	...
Rensaison	Acidulated, Gaseous ...	6/	...	23/	...
Roisdorf	Do. do.	6/	...	23/	...
Saidschutz	Saline, Purgative.....	11/	...	42/	...
*Saint Galmier	Acidulated, Gaseous ...	6/	...	*28/	...
Saint Moritz	Ferruginous	13/	...	52/	...
Saratoga.....	Alkaline, Gaseous .....	...	12/	...	47/
Schwalbach	Ferruginous	8/	6/	30/	23/
Schwalheim	Acidulated, Gaseous ...	9/	...	35/	...
Seltzer	Do. do.	6/	4/	23/	16/
Soultzmatt	Do. do.	7/	...	28/	...
Spa	Ferruginous	10/	...	40/	...
Vals	Alkaline, Gaseous, &c.	9/	...	33/	...
Vichy	Do. do.	9/	8/	33/6	28/6
Do. Saint Yorre.....	Do. do.	8/6	...	32/	...
Weilbach	Sulphurous.....	10/	...	40/	...
Wildungen	Alkaline.....	11/	...	43/	...

Original Packages of Friedrichshall contain 30 qts. or 60 pts.; Giesshübler, 25 qts. or 50 pts.; Harrogate, 36 qts.; Hunyadi-Janos, 25 qts. or 50 pts.; Kreuznach, 30 qts.; Missisquoi, 24 qts.; Orezza, 30 qts.; Pulna, 40 qts. or 40 pts.; St. Galmier, 60 qts. With these exceptions all Original Packages contain each 50 quarts or pints.

Mineral Salts, Pastilles, &c. Carlsbad, Marienbad, Neuenahr, Krankenheil, Kreuznach, Orezza, Vichy, &c.

PRICE LIST CONTAINING FULLER DETAILS FORWARDED ON APPLICATION.

Deliveries in London daily by own Carts, or Parcels Delivery Co., FREE. Goods for Country carefully packed and delivered to Wharves or Railway Carriers. All breakages or shorts must be notified to and claimed of the Carriers. Orders from New Accounts must be accompanied by Remittance or London Reference.



HOOPER'S BRIGHTON SELTZER

Per **2/6** doz.

SIX DOZEN CARRIAGE FREE.

TRADE LIST.

BRIGHTON SELTZER	...	...	...	half-pints	2	6	per dozen.
"	"	...	...	pints	3	6	"
"	"	...	...	quarts	4	6	"
BRIGHTON VICHY	...	...	...	half-pints	2	6	"
"	"	...	...	pints	3	6	"
"	"	...	...	quarts	4	6	"
PURE POTASH	...	...	...	...	2	6	"
" SODA	...	...	...	...	2	0	"
LEMONADE	...	...	...	...	2	6	"
LITHIA (5 grs. each bottle)	...	...	...	...	4	0	"

Country Orders, of Six Dozen and upwards, Carriage Paid.
Special Terms for Quantity.

Town Orders subject to Liberal Discount, and Delivered Free.

Fresh Importations of—

German Seltzer, Friedrichshall, Carlsbad, Vichy, Pullna

And all other Foreign Mineral Waters on Liberal Cash Terms.

HOOPER & CO.,
Manufacturers and Importers of Mineral Waters,
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